Public Documents of Maine:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

Departments and Institutions

FOR THE YEAR

1900.

VOLUME I.

AUGUSTA
KENNEBEC JOURNAL PRINT
1900

A SHELTERED COVE, CROSS ISLAND, MACHIAS BAY.
First visited by Des Monts, or a detachment of his French party of adventurers, piloted by Champlain, in 1608-9.

AGRICULTURE OF MAINE.

FORTY-THIRD ANNUAL REPORT

OF THE

SECRETARY

OF THE

BOARD OF AGRICULTURE

FOR THE YEAR

1899.

PRINTED BY ORDER OF THE LEGISLATURE.

AUGUSTA
KENNEBEC JOURNAL PRINT
1900

STATE OF MAINE.

To the Honorable, the Governor and Council of Maine:

In compliance with the laws of the State, I have the honor to present the report of the doings of the Maine Board of Agriculture for the year 1899.

B. WALKER McKEEN, *Secretary.*

AUGUSTA, January 31, 1900.

MAINE BOARD OF AGRICULTURE—1899.

OFFICERS.

E. E. LIGHT, PRESIDENT.
JOHN M. WINSLOW, VICE PRESIDENT.
B. WALKER McKEEN, SECRETARY.

MEMBERS CHOSEN BY AGRICULTURAL SOCIETIES.

Term expires third Wednesday in January.

Cumberland County,		John J. Frye,	Portland,	1900
Oxford	"	John F. Talbot,	Andover,	1900
York	"	L. O. Straw,	Newfield,	1900
Somerset	"	S. H. Goodwin,	St. Albans,	1900
Sagadahoc	"	T. E. Skolfield,	Brunswick,	1900
Hancock	"	Nahum Hinckley,	Bluehill,	1900
Aroostook	"	Jonathan Benn,	Hodgdon,	1901
Franklin	"	F. H. Rollins,	Chesterville,	1901
Knox	"	E. E. Light,	Union,	1901
Penobscot	"	George N. Holland,	Hampden,	1901
Piscataquis	"	W. H. Snow,	Milo,	1901
Androscoggin	"	J. L. Lowell,	Auburn,	1902
Kennebec	"	A. N. Douglass,	Chelsea,	1902
Waldo	"	Joseph Ellis,	Brooks,	1902
Washington	"	E. F. Allen,	Columbia Falls,	1902
Lincoln	"	John M. Winslow,	Nobleboro,	1902

MEMBERS FROM THE UNIVERSITY OF MAINE.

Dr. A. W. Harris, Orono.
Prof. Chas. D. Woods, Orono.

ELECTED BY THE BOARD.

B. Walker McKeen, Secretary.

MAINE BOARD OF AGRICULTURE—1900.

OFFICERS.

JOHN M. WINSLOW, President.
E. F. ALLEN, Vice President.
B. WALKER McKEEN, Secretary.

Members Chosen by Agricultural Societies.

Term expires third Wednesday in January.

Aroostook County,	Jonathan Benn,	Hodgdon,	1901
Franklin "	F. H. Rollins,	Chesterville,	1901
Knox "	E. E. Light,	Union,	1901
Penobscot "	George N. Holland,	Hampden,	1901
Piscataquis "	W. H. Snow,	Milo,	1901
Androscoggin "	J. L. Lowell,	Auburn,	1902
Kennebec "	A. N. Douglass,	Chelsea,	1902
Waldo "	Joseph Ellis,	Brooks,	1902
Washington "	E. F. Allen,	Columbia Falls,	1902
Lincoln "	John M. Winslow,	Nobleboro,	1902
Cumberland "	J. W. True,	New Gloucester,	1903
Oxford "	J. A. Roberts,	Norway,	1903
York "	S. H Garvin,	Acton,	1903
Somerset "	Ansel Holway,	Skowhegan,	1903
Sagadahoc "	J. F. Buker,	Bowdoin,	1903
Hancock "	Nahum Hinckley,	Bluehill,	1903

Members from the University of Maine.

Dr. A. W. Harris, Orono.
Prof. Chas. D. Woods, Orono.

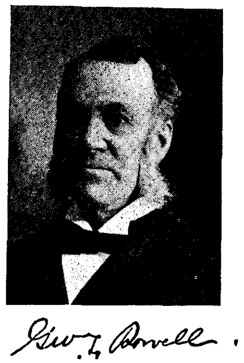
Elected by the Board.

B. Walker McKeen, Secretary.

INSTITUTE PAPERS.

TILLAGE AND GREEN MANURING.

By Hon. GEO. T. POWELL, Ghent, N. Y.



With this question of the tillage of the soil there is very much more connected than merely the subject of the soil itself. It is very intimately associated with the subject of the depopulation of certain of our rural districts and the wonderful and unparalleled growth of our cities during the past thirty years. So that I look upon this question of the management of the soil as one that is of very vital importance to the interests of the State. We have long been calling upon the soil for its production, and we have now reached a point where the question of self-support is concerned, and in recent years while our soil has seemed to fail to give that support which the people of our State to-day require, there has been a distressing period of depression in agriculture which has been most serious in its effects. There is not time this afternoon to discuss the very important phase of this question,—the movement of population so rapidly from our soil of late years to cities; but I believe that it is possible for this movement to be made back again, but only in proportion as the soil can be made self-sustaining. The value of the soil is in its income paying ability, and when farms are not paying of course there is little value in them, and the natural result is that people go away from the farm, and especially the young men.

If I were to ask you this afternoon what is the first object of tillage, I presume a very large number would answer, the destruction of weeds. While this is one of the important objects of tillage, I do not look upon it as by any means the most important. As I understand the purpose of tillage, it is that we may be enabled to get still further the plant food from the soil; that we may be able to take more wealth from the soil, which has in all these years past been so productive and built up such a prosperous class as has been represented in the farmers of our country. So let us take up the discussion, then, this afternoon, from the practical standpoint of the tillage of the soil. I think we have not quite understood the fundamental principle involved in tillage. I think it is not true that our soil is exhausted. You will recall the statement made by Director Woods in his admirable address this morning that there is a great abundance of plant food still left in our soil; and I look upon tillage, in its most intelligent sense, as a means of getting at this, or getting more of it.

We have not given sufficient study to the question of implements. The recommendation that comes to us as farmers from agents and manufacturers in the selling of plows is this: "The plow is so constructed that it is of exceedingly light draft." That is the recommendation that comes to us from most manufacturers, and it is from that standpoint that farmers purchase plows more largely than from any other,—from the standpoint of light draft. I do not look upon this as a correct principle in the purchasing of the plow. I look upon a plow as an implement that is going to do a certain thing for us. Let me give you an illustration. A few years ago two agents came to my place, one representing one kind of a plow, the other representing another manufacture. The claim of one of the agents was, that his plow was the lightest in draft that was made. The two plows were set at work in my fields, and tested side by side, and as they had gone around a certain piece of land the question was put to my men, Which of these plows do you like best? They said, "Why, the easy running plow." After looking over the work of these implements I said to my men, "That is the plow that we do not want on this place," and then I explained the difference between their workings. In observing the work of the plow for which the claim was not made that it was of particularly light draft, you would discover that as it went through the soil it not only broke it and turned the furrow, but in that process it absolutely ground and reduced this soil into the finest particles. The other simply cut through the furrow and turned it over with the least resistance, and the result was that it did very smooth, fine work to look upon, but the effect upon the soil was not nearly as valuable to me as that of the plow that ran harder, and that gave more resistance to the soil and broke it up and ground it finer. Now what did the harder running plow do? In its process of the manipulation of the soil it made more available the plant food that we are after. So when we purchase plows, farmers, we want to study their construction. We want to study the form of the mold board; we want to study also the construction of the land side. We want to understand that when a plow goes into our soil it is going to liberate more plant food for us as the result of its use. And thus the study of the construction of plows becomes a very vital one.

The next point in the consideration of the subject of tillage is the use of cultivators; and I would by no means purchase a cultivator because it was a light running implement, but I would purchase with the same principle in view that I had in the purchase of a plow—that when it has done its work it has still further reduced and refined the soil, because in every process of refinement we are getting at the plant food that is still so abundant in all our soil. There is poor excuse for a farmer to spend money in the purchase of commercial or artificial plant food until he has first made use of that which is abundantly under his feet. I am a believer in the use of fertilizers, but not until I have made available the most that is possible within reach of my own labor. So I look upon the principle object of tillage as the further liberation of the plant food which still exists very abundantly in our land.

Now let me go on to the second consideration in the question of tillage. After we have thoroughly manipulated our soil, and put it in the finest possible condition for the reception of seed, I consider that the object of tillage next in importance is the controlling of the moisture of our soil. Now we all know from experience the effects of the long, protracted period of drought which visited almost the whole country during 1899. It has been one continual report, from one end of the country to the other, of prolonged and excessive drought, during the present year. I look upon tillage, in its second great object, as one of the most successful means of combating the serious effects which follow long droughts, and in the discussion this afternoon I want to speak very particularly upon this point, because we are subject to future visitations of drought; and yet I believe it is possible, through the use of tillage, for us to reduce, in most instances, fully fifty per cent of the losses which usually come to us from dry seasons. I believe it is possible for us to grow certain crops right through a season of drought like this and suffer comparatively little loss. But we must understand the principles which underlie the question of the loss of moisture, and how to control conditions so as to prevent these great losses.

I want to speak now of the manner in which we lose moisture in dry times. There is always an upward movement of water in the soil. The dryer the conditions of the atmosphere and the higher the temperature, the more rapid becomes this upward movement of the water, and hence it passes off rapidly by evaporation and our crops suffer unless we understand just how to control this loss of moisture. I will use the blackboard to illustrate this point. We will take, for instance, a certain amount of soil, in the form of a cube, and if we could look into this by the aid of a microscope we should find that there are very minute openings in the substratum through which the water is continually pressing toward the surface. This principle is called the principle of capillary attraction. It is rather difficult to explain, but it is a fact, however, that there are passages all through the soil through which the water is constantly seeking the surface. Now one of the great objects of tillage in dry seasons is to hold back, or keep down, this soil moisture; at least, to so control it that it shall pass through the plant that is upon the soil rather than pass out and be evaporated without going through the plant. The roots of the plants (in a field of corn, for instance) penetrate to a certain depth of the soil, and they take up the moisture that is constantly pressing up towards them. Fine tilth, fine culture at the surface, will so seal over the openings of these capillaries that it will be possible in a season like the past to carry a corn or a potato crop, or an orchard through very successfully. In regard to the yield from the above crops, the drier the season becomes the more frequent should be the cultivation. The cultivator should run over this surface until it becomes as fine as it is possible to make it. We should cultivate the surface frequently, because we can make such a fine condition of the soil that we can put it in the form of a mulch, and the moisture, as it presses to the surface, will be held underneath this mulch. The result will be that the roots of your corn, your potatoes, or your orchard trees, will receive more moisture and your crops will go through even long, protracted droughts with better success. So cultivation, or tillage, means first, making available, as far as possible, the plant food that is still in the soil, and second, the holding back or the conserving of the moisture, that the plants may utilize it. We must look upon tillage from these two standpoints, farmers. I think there is no one present this afternoon who cannot, during the worst drought that may come to him, increase his yield through this practice at least fifty per cent from what it would have been if he failed to understand these principles.

Now another thing that will aid very largely in this whole matter, both in obtaining a larger amount of plant food, and also in helping to control the moisture, is the incorporation of green manure plants. I want to speak now very definitely upon this line. One of the reasons why droughts are so severe in their effects upon our crops of recent years is the fact that much of our soil has lost so largely of its vegetable matter. Our soil has lost to a large extent the humus which is always present in new soil. In farm lands that have not been long under cultivation the principle of humus is actively present, and the more humus, or the more vegetable matter, the soil contains the greater is its ability and power to resist drought. Since through the long years in which we have taken so much production from the soil we have reduced or destroyed largely its vegetable matter, one of the first important duties that comes to the farmer is to reincorporate vegetable matter. Now the question arises, How can this most economically be done? This morning Prof. Woods spoke of the leguminous plants, of the power of the clovers and the peas and the beans to bring to the soil again the nitrogen which it has so largely lost. It has been my practice to use these plants largely for this purpose, and not only for the building up of the nitrogen of the soil, but also to reincorporate the vegetable matter, or humus, and I want to give you, as briefly as possible, the results of some of the work in this direction. I have here a chart which represents just what has been done on my own farm. The chemist can speak to you of the principles of chemistry, and yet you can, perhaps, understand more clearly when you can see the results of the principles which the chemist has worked out. You can comprehend, perhaps, a little clearer when you can see the figures themselves which indicate what has been produced by these practices. And so it gives me pleasure to give you the direct results which have been obtained in the use of clovers in my own soil. While conducting a series of horticultural schools in New York state, under the auspices of Cornell University, I had with me one of the chemists of the Experiment Station at Cornell. In listening to the discussions upon tillage, the use of clover, and the carrying of large crops of fruit through seasons of protracted droughts, it occurred to this chemist to ask the question if I knew exactly what I had been doing. I replied that I could only say in a general way that there had been steady and rapid improvement in the production of fruits; that I had carried large crops of apples and pears through periods of weeks of continued drought with little perceptible injury to these fruits. He made the proposition that if I would send samples of soil he, as a chemist, would determine exactly what had been done. These figures are the result of the work of the chemist upon my soil.

CRIMSON CLOVER AS A GREEN MANURE.

ANALYSIS OF SOILS.

Three crops clover.		No clover.	
	%		%
Water	15.00	Water	8.75
Nitrogen	.21	Nitrogen	.12
Humus	2.94	Humus	1.91
Phosphoric acid (available)	.015	Phosphoric acid	.008

Water, 6.25 per cent equals 46.875 tons.
Nitrogen, .09 per cent equals 1,350 pounds.
Phosphoric acid, .007 per cent equals 105 pounds.

Two samples were sent, one from an orchard where three crops of crimson clover had been grown and plowed in. I use the crimson clover because it does well upon my place. It is especially valuable, as it can be grown after the soil has been cultivated through the early part of the season. Being an annual plant, and growing better in the cool season of the autumn months, it is especially adapted to this purpose, and hence I use crimson clover almost entirely as the means of improving my soil. Samples of soil were taken from one field where three crops had been plowed in, and another sample from a soil where no clover whatever had been used. The chemist found when he came to apply his test to these soils for the water content that the soil which had had three crops of clover plowed in contained 15 per cent of water. It is not necessary to give you the details of the operation, but I will say that in both instances the soil was dried in an especial manner before this experiment was made. Then the chemical test was applied for the amount of moisture that was left after this process had been completed. He found 15 per cent of water in the clover treated soil and 8.75 per cent in the soil that had not had the clover upon it. What does that mean per acre? 6.25 per cent more of moisture in an acre of land represents nearly forty-seven tons more of water to the acre. Now that is a very important fact for us to know, for when a period of drought comes upon us if our soil is in possession of an abundance of vegetable matter you see the larger amount of water which it carries, for these samples of soil were taken at the end of a six weeks' drought.

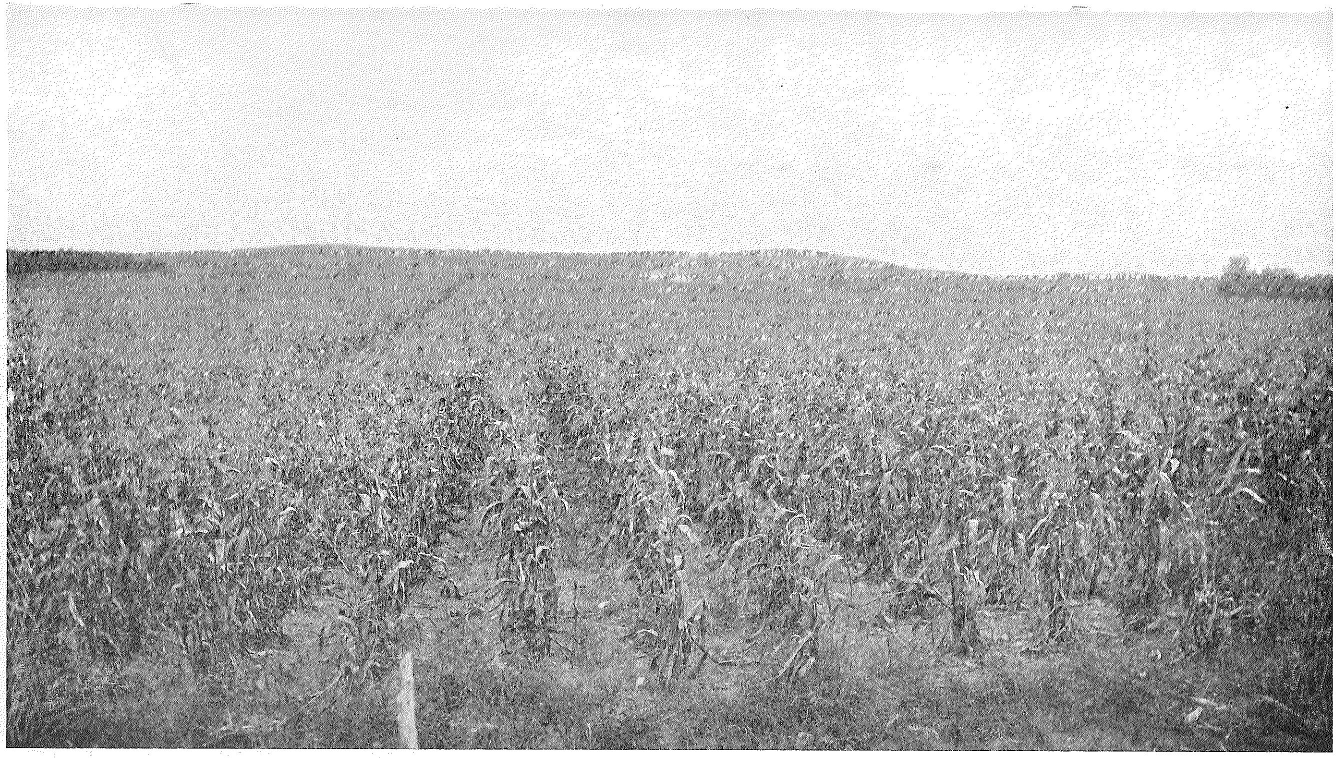
I will call your attention next to the humus, as that naturally follows in this discussion. When he tested these two samples for humus, he found that the clover treated soil contained 2.94 per cent as against 1.91 per cent in the soil that had had no clover. We have the explanation of this larger amount of water in the clover treated soil, in the larger amount of humus which that soil contained, the result following the three crops of clover plowed in.

We will next notice the nitrogen, and here is an emphatic endorsement of all that was said this morning by Director Woods in relation to the clover plant having the power to take nitrogen from the atmosphere and build it up in the soil. We will see what the figures mean. The chemist found in the clover treated soil .21 per cent as against .12 per cent in the soil with no clover in it. Now a difference of .09 per cent of nitrogen in one acre of soil over another (and the chemist understands how to make his computations so that they are absolutely correct) represents 1,350 pounds; so that during three years' time there was added to this clover treated soil 1,350 pounds of nitrogen per acre. What would that have cost me if I had purchased this nitrogen in the market, at the basis of fifteen cents per pound, which is far lower than is usually paid for nitrogen in the market? Director Jordan, I think, last year in his investigations showed conclusively that the average price paid by the farmers of New York state was nearer twenty cents per pound; yet by the lowest calculations, taking the wholesale value of nitrogen, if I had purchased in the market it would have cost me $202.50 per acre. You see that would be a very large outlay to make upon an acre of land for nitrogen, and yet this amount was added to an acre by the incorporation of three crops of crimson clover, using only ten pounds of seed per acre, and the seed costing but $3.50 per bushel. So you see the enormous gain, for a very small outlay of money, that comes to the land by the use of the clover plant, in bringing to it costly nitrogen.

I want to speak of one more substance, and that is phosphoric acid. The chemist found in testing for phosphoric acid that there was .015 per cent in the clover treated soil as against .008 in the soil which had no clover, which made a difference of 105 pounds more of phosphoric acid in the clover treated soil. Now the clover did not add that phosphoric acid, it simply found it in the soil, and by the development of humic acid, the active principle of which is to assist in the liberation of other elements of plant food, it was simply made more available, showing, as was said here this morning so truthfully, that our soil is still abundantly supplied with fertilizing elements but they are not in readily available form, and before they ever can be made available we must reintroduce the principle of humus that we may get the development of humic acid more actively, which will help to operate upon the potash, and upon the phosphoric acid, to liberate and make them more available.

Now I look upon this as giving us, as farmers, new inspiration and new hope in farming. I believe that when we can practically demonstrate such a lesson as this, and we can all do it, it opens up a new future to us. We can, in an inexpensive manner, bring back again our soil to a high degree of productiveness, and when we can do that we have solved the question of the higher value of land. While we were at dinner there was some discussion upon the causes which were leading so many people away from the farm and different causes were mentioned; but primarily, the great cause which has driven people from the soil has been its unproductiveness, the inability of people to receive incomes from the soil that were adequate to the kind of living which they wished to enjoy. In this day, too, farmers are often advised that they must live more economically. Sometimes on the public platform the farmer is charged with extravagance; the statement is made that he is supporting too many horses and carriages, that he has too fine a harness, that his house is too well furnished, that he should economize. I do not believe in this. If there is any class of people on the face of the earth that is entitled to all these things it is the farmers of this country. The farmers, who are the producers of wealth, should be enabled to share in its benefits, and they should have their houses well furnished and they should bring about them as many comforts in life as those who are engaged in other lines of work. And so I do not believe that this is the line to teach farmers,—that of rigid economy, but rather, that they should be taught to improve the productive capacity of their land, to increase their incomes and bring to them the better living which it is their right to enjoy. When we see the possibilities of incorporating green manure plants, like the clovers and the peas and the beans, and so improve the productiveness of our soil, we see the possibilities that come to the farmers of better living and better conditions in everything about them, and I believe that is the wiser line to teach upon, rather than the one of hard economy.

Now a few points in relation to the use of this clover. It was stated by Director Woods this morning that possibly in your climate the crimson clover was not valuable. It has long been considered that crimson clover was a tender plant, and could not be grown out of the southern latitude to any great extent. Possibly we have not learned yet all that can be done with this plant. I first saw it growing in Virginia, Delaware and New Jersey, and in studying the plant as grown in these more southern states it occurred to me that possibly in the northern states, with better tillage given to our soil we could utilize this crimson clover plant. Where it is possible to grow crimson clover it is especially valuable for this reason,—that you can give your crops all the early tillage which they require, you can cultivate your corn fields up to the period when cultivation must cease, and then you can sow crimson clover and get excellent results from it, in perhaps a higher range of latitude than at present is thought possible. On my own farm, which lies in the vicinity of Albany, which is quite well north as you understand, I began experimenting something like eight years ago, and I have found in my experience that the higher the degree of cultivation which I have given my soil the greater has been the success with crimson clover. So I have learned the lesson of good tillage; and I want to say this afternoon, for the encouragement of those of you who may be inclined to experiment with it still further, that I have not had a single failure in the growth of crimson clover for the eight years in which I have used it. During the present season, which has been remarkable in the extent and prolongation of the drought, it has been a success, and I have a magnificent covering over my fields, to-day, of nearly 80 acres in extent. It did seem, when this seed was being sown, right in the extreme dry period of July and August, as though this year must record a great failure, but we went on and sowed in faith and our faith is rewarded, here at the beginning of the winter, with an elegant covering of this clover. So that I have great faith in the pushing of this plant even farther north than it has been supposed that it could be grown. Let me say to you that where clover cannot be grown successfully, great benefit can be obtained from the use of the southern cow pea. That will grow more rapidly. You can get, possibly, a more rapid building up of the soil with the pea plant, but I do like the crimson clover for the reason that wherever it can be grown it makes such a splendid winter covering to the soil. You, undoubtedly, in Maine, have a better covering of snow than we do in New York, hence you get the benefit in your State of the soil being covered in the winter more largely by snow, which is exceedingly valuable; but in New York, as snow does not come to us as it did years ago, and we sometimes pass through an entire winter with scarcely any covering whatever from the snow, any plant that will go into the winter and cover the soil is valuable to us. Crimson clover, when it gets a hold in the soil, goes through the winter and protects and mulches the soil, which is very valuable, as evaporation goes on in cold weather. Although it is not so rapid as in hot weather, still there is a loss in an uncovered soil during the winter. The



SWEET CORN FIELD OF HON. JOHN M. DEERING, SACO.
27 acres; yield, 90,000 pounds; variety, Medium Early Crosby; soil, sandy loam; fertilizer, 6 cords barn manure and 350 pounds phosphate per acre.

question very frequently comes up, will the clover not kill out in the spring? It is true that frequently there will come a week of hard freezing nights and thawing days which will result in killing the plant absolutely, but we have reached the springtime and its loss then is not so great. There is greater value in it if we can carry the living plant through the entire spring and let it begin its active growth during the early warm weather, but if we can succeed in getting its growth in the autumn and then have our soil covered during the winter months it is exceedingly valuable, and I would not hesitate a moment upon the ground that it may kill out in the spring.

I have given you, now, an outline of the object of tillage and its value, as I understand it, and as it has given me results upon my own farm, and the value of green manuring as helping to build up the nitrogen of the soil and bring back to it vegetable matter. The result of these last eight years has been that there has been a steady improvement in the productive ability of my soil. There has been a steady improvement in the quality of the fruits and the different productions of the farm. The corn crop has increased in yield continually, and the potato crop has again been more successful. In my section of the state we have almost abandoned potato culture because of the uncertainty of the crop, but I believe that with this system of tillage, accompanied by the incorporation of green crops, as good potatoes could be grown as ever were grown there. The study of these principles opens up to us new uses and new possibilities in farming.

Another point is in the thrift and health that are given to trees. We have been suffering from irregularity in the bearing of orchards of late years, and I have no question in my mind but that by the depletion of vegetable matter and by the severe drying out of the soil about the roots of trees during these dry seasons, when the frosts of winter penetrate so much more deeply, orchards are injured seriously and as a result we get these uneven years of bearing. The past year has been remarkable in the absence of fruit, and I believe there is a relation existing directly between the dry condition of the soil and the roots of orchard trees. And so by the incorporation and addition of vegetable matter we shall find a reinvigoration of the trees in our orchards. I am confirmed in my opinion by the fact that since the use of this system of culture I am getting larger yields of fruit and more uniform bearing from the trees. There has been scarcely a season in eight years but that I have had uniformly good crops of apples, just about as many one season as another, and I can attribute it to no other cause than this system of tillage and green manuring which I have brought to the orchards. So you see that this opens up to us new possibilities in the increased value of the land and the increased productions from it, which mean, of course, a higher degree of prosperity to those who own the land.

Ques. How much farther north can the cow pea be grown successfully than the crimson clover?

Ans. I think the cow pea can be grown almost anywhere at the North. It is grown extensively in Canada, and I think it can be grown in almost any of our New England and northern states. It is of quicker growth and you get the benefit of it rapidly in the soil; but the first frost that comes in the autumn cuts it down and kills the plant. It has done its work, however, and your soil has the nitrogen which the pea plant has been enabled to bring to it. In a short period of time, say from July to September, the cow pea will make a much more rapid growth than the crimson clover. It is only a question of whether you can get growth enough with crimson clover from the time you stop cultivating your corn and potatoes until the opening of winter to pay you to sow it. That is, I think, the real problem. I have no question but that your Maine soil will grow the clover plant, but it is a question whether you can get growth enough in the short period of time in which it has to grow in your State, to pay.

Ques. About how long a time is it after you sow it before winter closes in?

Ans. I sow, usually, upon my own farm, from the 15th of July to the first of August. We push cultivation in our orchards very vigorously from the opening of the spring until toward the middle of July. Then cultivation ceases. Then we put on from ten to twelve pounds of seed of crimson clover to the acre. If the conditions are at all favorable at that time, if there is a little moisture, if a few showers happen to come just at that time, it will germinate and grow very quickly. If it is as dry as it has been during the past year the germination is slower and it takes the plant a longer time to make a covering. This year for weeks it was so feeble and so small that it seemed as though it must be a great failure, but later in the fall, as soon as a few showers came, it sprang into active growth, and to-day it is surprising to see what a fine covering it has made, and it has made it all since the 10th to the 15th of September.

Ques. Is this grown only for a mulch?

Ans. Simply as a catch crop. It is sown to improve the soil and also to make as much of a winter covering as possible.

Ques. Wouldn't it be valuable to plow in after it gets its growth?

Ans. I always plow it in in the spring, just as soon as I can. My own soil being of a loamy character, what would be called a gravelly loam, I do not like to plow in the autumn. The heavier limestone or clay soils are often improved by fall plowing. On soils that are lighter in character I would rather have a cover crop than to plow them in the autumn; so I prefer to let the clover cover the land in the winter and then plow it in in the spring. If it is frozen out of course I lose the benefit, somewhat, of the larger amount of top which would be plowed in, but the roots are there and they have done their work; the crimson clover does fill the soil very full of roots.

Ques. How large a growth does it usually make?

Ans. I have a growth at the present time from six to seven inches in height over very much of my land. Last year being a season of greater moisture, when winter came upon us we had crimson clover plants that measured twelve or fourteen inches in height, sown after all the cultivation had ceased.

Ques. Why could it not be sown in orchards as early as May?

Ans. If you sow as early as that you lose the benefit of your tillage, and I am a great believer in thorough tillage, particularly in a season like this. With the season advancing and continually dry, it is the time above all others when you want to keep your cultivators running.

Ques. You say you sow the crimson clover following other crops; how about oats and wheat?

Ans. Those are the crops, of course, that you cannot cultivate. You cannot stir those crops unless you do as they do in

England,—sow them in drills and run the cultivator between the drill spaces.

Ques. Why wouldn't this clover do as well as oats sowed in May?

Ans. I have sown clover in with oats and I have sown clover with buckwheat; and as dry as this season has been I want to say to you that in both instances when the oats and buckwheat were cut there was a very good stand of clover. It has surprised not only myself but my neighbors that even in this very dry season, in buckwheat and oats there is at the present time a good stand of this clover upon the soil.

Ques. What do you say of red clover?

Ans. Red clover is excellent, it is just as good as the other, but there is this difference: The crimson clover is an annual, and it is the law of all annual plants that they grow rapidly. They have to grow rapidly, their life being but one year, and here is where the particular value of crimson clover comes in. It being a plant that from a law of nature has to grow rapidly, you can cultivate corn or any of the cultivated crops of the farm, you can accomplish all that can be done by cultivation and then you can put on your crimson clover and during the balance of the season it will make a rapid growth. Red clover is a biennial; it requires two years to perfect itself, and you cannot do with red clover the same thing that you can do with crimson clover. The red clover is equally valuable but you have to let it remain in your soil about two years to get the fullest benefit.

Ques. Suppose you had a run-out field and you plowed it and sowed crimson clover on it, would it do well?

Ans. I think that would really be the most economical way to bring up a badly run-out field. If clover would not thrive sufficiently well in your State I would put on a crop of buckwheat and plow it in; I would follow that with rye, and plow in the rye. Then I would follow with clover, and I think you would get the clover to grow. And if you can get one crop of clover to stand it is much easier to get the second, because when you have introduced this bacterial influence, when the bacteria which was mentioned this morning by Prof. Woods are once introduced and actively working in the soil, then it becomes far easier to get your clover to take. That has been my experience in the use of crimson clover. The first year it was rather feeble in growth, for the reason that there was an absence of this bacterial influence. From the general failure that has come all over the East in the growing of this plant, our land has depreciated in its value; but when the clover is introduced, when the bacteria are actively at work, it is easier to secure a second crop, and the longer you continue in the growing of clover the better will be your success.

Ques. Wouldn't you recommend sowing more than eight or ten pounds?

Ans. That is sufficient for my place. On thinner soil possibly twelve or fifteen pounds might produce a better result. With me ten pounds is sufficient, and I have used only eight pounds, and in an ordinarily favorable season have obtained a very excellent covering.

Ques. Is the seed of crimson clover small like the alsike?

Ans. No; it is a little larger than the common red clover. There is one point in relation to seed that I ought to mention to you at this time, and that is the importance of getting home grown seed. I have no question but that much of the seed which has been sown in your State and all through our northern states has failed of results because it has been imported seed instead of home grown seed. In portions of Germany, France and Italy, where crimson clover is grown extensively, the plant is attacked by a fungous disease which impairs the vitality of the seed when it is sown in our soil, and in our climate. There are four or five different kinds of this clover. The plant that produces the white blossom is of no value whatever in our country. It will merely germinate, and will never grow. The imported seed has been used extensively because it is cheap, and because the demand is so much greater than it has been possible to meet by home grown seed that many have been forced to use imported seed if they used any, and there is no question but that much of the failure has come from the use of foreign seed which has been injured by the fungous disease to which it is subject in the country where it is grown. When it comes to our climate it has very low germinating vitality. If you, in the State of Maine, were going to attempt to grow crimson clover and stick to it and test it for years, I should say this: In the most favorable portion of your State, where it can be grown, start it and get the seed, if possible. Now continue to grow from that and use the seed grown from your own soil, and I will venture to say that in a few years you would have a type of crimson clover that could be grown quite successfully in your State. I believe you would succeed better if you could grow the plant here and take the seed produced here. I attribute my own success to purchasing directly from Delaware farms where I know that the plant has been grown and that foreign seed has not been used. The history has been that where the seed has been sown that comes from the diseased districts the disease has followed down to the fourth and fifth generations, showing that the seed is weakened in vitality.

One word in relation to the use of clover in corn fields and potato fields. It has been our practice to cover every foot of land with crimson clover that has been under cultivation for the past eight years. My farm being very largely a fruit farm, we are not growing the general farm crops to any great extent, but if in the breaking up of land and preparing for trees corn comes in the rotation, we always sow the crimson clover seed at the last cultivation of the corn. Now for strawberry culture we always follow corn with potatoes, because we want that very fine mechanical condition which I have been discussing this afternoon. We have planted potatoes upon as fine a clover sod as I have ever had, which was grown in the preceding corn crop; so that the yield of potatoes has run up to 250 and 300 bushels per acre, and that without the aid of special fertilizers. Of course in the growing of strawberries commercially we add not only stable manures, but commercial fertilizers abundantly. We add two elements only, of plant food, the potash and the phosphoric acid, because we get our nitrogen so much cheaper through the agency of the clover plant. In the preparation of a piece of land for strawberry culture there comes first the corn culture, and in the corn is sown the crimson clover which has so far given a splendid covering by the next spring so that we could plow down a very excellent clover sod, and this is followed by potatoes, and a very fine sod is formed by the clover in the potatoes. Of course this necessitates digging your potatoes with a fork, as you could not use the potato digger because it would destroy so many of the clover plants. But in digging with a fork, as the cooler weather comes on the clover spreads and virtually covers the whole ground. That has been my experience. In raising corn and potatoes we have cultivated as long as we could and then have secured as much growth as I have described to you of the clover, and the land has been better each time after these crops have been taken off than before. That is an important statement to make, but I believe it is true. Our practice has been to deplete our soils through the process of production, but I believe that by wise, judicious tillage, and incorporation of these plants, we can continue production indefinitely and improve our soil.

Ques. Do you put nitrate of soda on your potatoes?

Ans. I have not. I think I have had sufficient nitrogen by the two years' crops of clover previous, to give me all the nitrogen I need, and so I have used nothing in the form of nitrogen beyond what the clover plant has afforded. You see by these figures that I have given you, 1,350 pounds per acre in three years gives a pretty strong supply of nitrogen to grow anything upon.

Ques. How is lime for strawberries?

Ans. Lime is good always. Where you are incorporating a large amount of vegetable matter lime is most excellent. There might be a possibility of incorporating so much green matter that an acid condition might be developed, and in that case the use of lime would be most excellent. It would correct any possible development of an acid condition which would be disastrous to certain crops that might follow.

Ques. If you were to cultivate especially to conserve the moisture how deep would you plow?

Ans. According to the depth and character of the soil. The first cultivation, early in the season, should be deep. If you are going to put on heavy cultivators, after the plowing is done, put them right down on the very start. If you are preparing a piece of land for corn or potatoes, cultivate just as deeply as you can in the beginning. Do your deep culture early in the season, and then, as the plants begin to grow, as the roots of the corn begin to extend and your potatoes begin to set, the cultivation should lighten up and from that time should be merely surface cultivation. In that way you can continue tillage until the corn will reach the backs of your horses as they go through it. But the more advanced the plants become the lighter should be the tillage.

Ques. Wouldn't it be just as well to use the plow that is of easy draft and then use the harrow, when you put your crops in?

Ans. I know that a piece of land looks very fine when it is turned over so evenly that every furrow looks precisely alike, and every farmer who takes pride in his work of course delights to look over a smoothly, evenly plowed field, but for me, when a field is plowed I prefer that it shall be in the roughest possible condition; that its exterior shall present, not a smooth surface but a surface that is completely broken to pieces; and so I prefer the plow that will leave the land in that condition, to the one that has a slanting land side and mold board so shaped that it will cut and roll the sod over without breaking it.

Ques. If it is a wet season do you cultivate your orchard often?

Ans. If it is excessively wet of course you cannot do it. With this fine tilth, which is obtained through tillage, it would not be wise to go upon that soil when it is excessively wet. I vastly prefer a dry season. The year 1898 I lost my entire fruit crops, with the exception of currants and grapes, by the excessive rainfall. During the spring of 1898 we had almost forty days and forty nights of rainfall, so that when the trees and small fruits finished their blooming there was scarcely any fertilizing principle left in the blossoms, it was washed away by such continuous rains. We could not cultivate our orchards that season as we would like, and the soil became compacted and hardened, and was in a very hard mechanical condition all through 1898. This past year has suited me, for the most of my crops.

Ques. If you were going to plow an orchard would you plow deep enough to break off the roots of the trees?

Ans. I should not disrupt the roots of the trees. Cultivation in orchards should be shallow always. Do not disturb the roots of your growing trees. In the preparation of the soil for an orchard you should plow as deep as the soil will permit, and then if the trees are set properly, which should be a little deeper than they come from the nursery, by continuing your tillage the roots will go down. The more you till a young orchard the more the roots go down. If you cease to till, the roots come to the surface, and then tillage is very disastrous to the orchard. Let the tillage be as deep as possible in the beginning, then continue your tillage and the roots will keep out of the way of the plow, mainly.

Ques. In plowing an orchard would you back furrow it, or have it level?

Ans. I would have level culture. Plow toward your trees one year and the next year plow away from them, and you change your land and leep it level. If you get the land ridged too much there is more danger from borers and difficulties about the roots of the trees.

Ques. If you wanted to drain the land by open drains you would back furrow some, would you not?

Ans. If it were necessary to do that I would underdrain the land before the trees were set.

Ques. What would you do with an orchard in grass?

Ans. I would plow it up as quick as I could. I do not believe you can grow grass and good apples in the same orchard, a great while. So I would very carefully break up the sod, if it had been for many years in grass. My father planted the first orchard on the farm upon which I live to-day, and for many years the old orchard was left in grass. When I took the business and began planting more extensively, I began with the system of tillage which we have been discussing so fully this afternoon. I found that the fruit was so much finer in the tilled orchards that I finally concluded to break up the old orchard which had been on the farm for nearly fifty years. So we took first what is known as the cutaway or disc harrow, and went in in the spring and cut that sod all to pieces, going both ways through the orchard. Then we took a plow and set it very shallow, not to exceed three inches in depth, and did not attempt to turn any furrow. In that way we loosened the sod, and then we put on a spring tooth harrow and harrowed it all to pieces. We virtually destroyed the sod without cutting the roots of the trees, which lay close to the surface, and we have been cultivating that orchard ever since, nearly four years.

Ques. Cannot you raise good apples by topdressing?

Ans. You can raise good apples that way, but if you have extensive orchards it is difficult to get enough topdressing material. If you topdress one year the next year the grass grows stronger. So I would rather take the old orchard that is in grass and destroy the sod, then keep the cultivator going, and with suitable pruning you will bring it back to a very profitable condition of bearing. I am a thorough believer in tillage in everything.

Ques. Do you ever raise grass after green manuring?

Ans. I have seeded down, and I think the yield of timothy has been doubled as the result of this system of green manuring.

ORCHARDING FOR MAINE FARMERS.

By F. H. ROLLINS, Member of the Board for Franklin County.

The subject of fruit growing or orcharding is one of great importance to the farmers of the State of Maine.

Three years ago, or in 1896, it was estimated by the officials of the State Pomological Society, from data procured at that time, that there were grown in Maine in that year, one million five hundred thousand barrels of apples. Of this vast amount one-third were either left unharvested on the trees, or were small or wormy and left to decay. Another five hundred thousand barrels were sold by the growers, principally to the export merchants, for about seventy-five cents per barrel. These same apples were sold in England after the first of January, 1897, for from two to four dollars a barrel. At these prices you will readily see that there was no profit to the grower. For I do not believe that under present methods of production we can raise apples and furnish barrels and pack and deliver them at the railroad station for that price and make a profit. The last five hundred thousand barrels were sold for a larger price and at some profit to the orchardist.

Now what was the trouble, that in a year of an abundant crop it should be a year of disaster from a business standpoint? A partial answer to the question is that the crop was not put upon the market in the best possible condition. The market was loaded down with a large amount of second quality fruit that should have been either evaporated or canned and thus advanced from a second to a first quality product.

But why go back to that year of an abundant crop, of hard labor and little profit? Simply for this reason, that we may learn from lessons of the past, what to expect and how to manage in the future.

The question has been asked, How can we dispose of our second quality apples at a profit? The logical answer to this question seems to be to use the spray pump "early and often" to the end that scabby, wormy and inferior fruit may be reduced to a minimum.

In years when there is an abundant crop, and at any time when we find trees overloaded, it will no doubt pay to remove some of the fruit, picking out the inferior and wormy specimens and feeding them to the sheep or swine. This may often save the necessity of putting props under the limbs to keep them from splitting down, and there is no doubt but the apples left on the trees will bring more money than would be the case if the whole crop were left to mature. In years of a large crop, and consequent low values, second quality fruit should never be placed upon the market in its natural condition, but should be put into an attractive form either by the evaporating or canning process. An orchardist who has five hundred barrels or more of second quality apples or can buy them at low values from his neighbors, can dispose of them to the very best advantage by evaporating them by the use of steam. A plant for this purpose could be established for probably about $500. This would last for many years, and only the interest and usual wear need be considered in the cost of each year's product. In evaporated apple you have a product that will keep for any length of time with slight deterioration in quality or value, if kept in cold storage through the summer. By this method the crop may be kept until the market conditions are right for its sale.

For the farmer who has a less amount of fruit than is mentioned above probably the canning method would be more satisfactory. By this method only a small amount of money need be used in permanent fixtures. A galvanized sheet-iron kettle set in brick work with a good fire-box underneath; a paring machine, the Eureka costing twenty dollars or the Bonanza costing seven dollars preferred; a fire-pot using gasoline for fuel, or a charcoal heater if preferred, for heating sealing tools; a capping iron and tipping copper with two galvanized sheet iron pans to place the cans in for cooking, are nearly all the fixtures needed for canning apple. These, and all other necessary tools, provided the cheaper paring machine is used, need not cost more than thirty-five dollars. Cans can usually be procured at the nearest corn factory for a reasonable price, but they may be bought in New York or Baltimore by the carload for a little less money. A supply of solder and a small quantity of muriatic acid complete the outfit. With this outfit you can put your second quality fruit in first-class shape and can take advantage of market conditions for the next two years. I firmly believe, and my experience has proved that this is the very best way to dispose of second quality fruit. Any intelligent man can learn to do this work in one day.

When a person has an evaporating equipment he can dry the cores and skins which usually sell in the Boston market for from forty to sixty dollars per ton. This is the basis of a great part of the fruit jelly in the market. If this plan is not feasible, then the waste may be ground and pressed in the cider mill and the juice converted into vinegar which usually sells for a satisfactory price. By this method the whole crop is utilized and made to serve some good and useful purpose.

I am firmly of the opinion that this industry of canning apples could be carried on by many of the farmers of Maine with great profit and advantage to themselves. Of course there are many things to be taken into consideration before engaging in a new line of work, such as location, distance from the railroad station, water supply, available help, fuel, market conditions, etc.

How and to what extent shall we assist nature to produce a crop of apples or other fruit for our benefit? Nature has done much for us as orchardists in this good State of Maine, by giving us these rugged hills with their strong, well-drained soils, and a climate that is capable of developing the finest flavor in our fruit. Although it is so cold that only the more hardy varieties will thrive, yet time has proved that these are the best of their kind after all. Nature has done much for us, but she will not do it all. Many farmers seem to think (I am sorry to note) that if they plant the tree, nature or Providence will do the rest.

But their success is not great. If their trees finally grow to maturity and produce a crop it is always in a year of an abundant harvest when prices are low and profits small.

If we wish to grow a crop of wheat or corn or any of the cereals, we first break up the ground, pulverizing it to a fine condition by using the plow and harrow. And so we must do with the orchard if we wish it to do its best work. In plowing the orchard, care should be taken not to go too deep or many of the fine roots will be broken which will cause injury to the tree, to some extent. About four inches deep will answer the purpose if the surface is kept harrowed and in a fine condition. This should be done as early in the season as the condition of the ground will permit.

This fine condition of the surface soil acts as a mulch, preventing the escape of the moisture in mid-summer by capillary action and by evaporation. The ground should be gone over after each rain, however, with the harrow or cultivator to pulverize the surface and break off the fine tubes where the water seeks the surface. The cultivation of the orchard also serves another purpose, that of breaking up the clods and particles of soil, thus liberating much plant food. The act of turning down the sod also adds to the humus, or organic matter in the soil which holds moisture until needed by the tree, lightens the soil, and by its slow decay adds to the store of available plant food.

I think (although we have never tried it) that barley or some other plant that will grow late and live through the winter should be sown in August after the trees have practically got their growth for the season, and then plowed under in the spring. This would utilize any plant food becoming available late in the season when the trees could not use it and prevent its being washed away, and would preserve it for use the next season. It would also tend to use the moisture in the soil in the fall and spring when there is a surplus. We found in our own work that during the severe drought of the past season where the ground was plowed in June and kept cultivated through the season, the trees made a good growth and promise to give a crop next year; while trees standing in grass land made no growth at all, and show very little indication of bearing fruit next year.

If for any reason, it is inconvenient to till the orchard with the plow and harrow, you can utilize the hogs and pigs to do the work for you. The hog is naturally a grazing animal and in the orchard he will very nearly get his own living. He will also tear up the sod, eating the grass and brake roots, of which he is very fond, and will eat all the grubs and worms that come in his way, thus ridding the orchard of many insect pests. From observing him during the past season I have become convinced that he is a great help in tilling the orchard. He will also eat the small wormy apples that fall during the summer, in that way doing all he can to rid the orchard of its worst enemy, the Trypeta pomonella, or railroad worm.

How shall we assist nature to furnish a sufficient quantity of plant food in the soil so that the orchard may do its best work? This is always a deep problem with the farmer. While the trees are young, and before they come to a bearing condition, but are making a large growth, they seem to require a fertilizer rich in nitrogen. For this purpose there is probably nothing better than common barn manure, thoroughly worked into the soil. This will stimulate growth and prevent that mossy, unthrifty appearance sometimes seen in young orchards. When the orchard is in bearing condition a fertilizer especially strong in potash with a little less phosphoric acid will give the best results in fruit, as determined by experiments in our own work. For instance, an orchard of about two acres in extent, that had been producing only a small crop of June grass was fertilized by sowing broadcast one ton of muriate of potash and one-half ton of ground bone.

This was sown in 1897, and plowed and afterward harrowed occasionally through the season. In 1898 the ground was kept tilled until about the first of July, when it was sown to clover, which made a good stand that year. In 1899 the clover, and the grasses that came up with it, should have been plowed down by the middle of June but on account of the severe drought and a consequent short hay crop, it was left until the first of July when what grass the mowing-machine and horse-rake would take between the trees, was harvested, and the rest plowed under. The hay amounted to about one ton to the acre and there were one hundred and twenty-five barrels of apples on the two acres. How much of this result should be credited to the fertilizer, and how much to the plowing is an open question, but probably one is supplemental to the other and each brings better results when used in combination. A large number of props had to be used under the limbs of these trees to keep them from breaking down under their load of fruit. Other trees in similar condition, but not treated in this way, did not bear any fruit. From observing similar methods of treatment on orchards in other sections of the State the past year, I am firmly convinced that this is the best way to treat them that is known at the present time.

When we consider the great increase in noxious insects that have infested the orchards for the last few years we do not wonder that the orchardist is somewhat discouraged. The tent-caterpillar and his cousin the forest caterpillar have ravaged large sections of the State, defoliating the trees, thus curtailing the production of fruit; not only for the past two years, but perhaps it will be several more years before the trees will regain their usual vigor.

The codling moth, and the bud moth are always at work. These insects can be destoyed most readily by using the spray pump with some kind of arsenical poison, Paris green preferred. The fungous growth which first appears on the trees, and later on the apples, and which is known as the apple scab, is doing much damage to the apple crop of the State. It can be controlled by spraying with Bordeaux mixture. A good and well-tried formula for this preparation, and also one easy to remember, is the following: Five pounds sulphate of copper (sometimes known as blue vitriol) five pounds lime, and fifty gallons water. The sulphate of copper should be suspended in the top of a barrel of water, using one pound to each gallon, and left two or three days to dissolve; slack an equal number of pounds of lime in the same quantity of water in another barrel, so that when ready to mix for use each gallon of this solution will contain one pound of the copper sulphate and one pound of lime. The lime is used only for the purpose of preventing injury to the foliage by the copper. Paris green may be added to this mixture at the rate of three-fourths of a pound to fifty gallons of water, to destroy the caterpillar, codling moth, bud moth, canker worm and leaf roller.

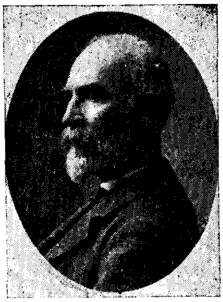
We should begin to use the spray pump as soon as the leaves begin to grow, going over the orchard once before the trees blossom, and again as soon as the petals fall. But avoid spraying after the trees are in blossom, lest we destroy those friends of the farmer, the bees that assist nature to produce fruit, by pollenizing the embryo blossoms. The use of the spray pump has passed the experimental stage and has become a necessity. It is not a question of whether it will pay or not pay, for an orchardist cannot afford to get along without this useful implement. Pruning is another feature of orcharding that often is, but should not be, neglected. Avoid, if possible, removing the large lower branches unless made necessary by using the team to till the ground. Remove all limbs growing parallel or crossing each other, also cut out the small scrubby growth in the middle of the tree; in that way giving the sunlight a chance to get in and develop and color the fruit growing in the center of the tree. This also helps to check the development of the apple scab. The spray of Bordeaux mixture has a better chance to completely cover the whole top, making the work much more effective. This work of pruning should be done while the tree is young, thus keeping the top in form. But if the work has been neglected do not hesitate to use the saw in early spring, when the wounds will heal quickly. The tree will have greater vigor, many buds will develop blossoms and a larger quantity of good fruit will follow.

Last but not least among the insect enemies of the orchardist are the borers. The young trees until they become at least two inches in diameter, should be examined very carefully as soon as the snow is off the ground for indications of borers. These should be cut out and destroyed. In June or the first of July examine again to find if any borers may have escaped earlier in the season, for the very life of the tree may depend on their extermination.

It sometimes happens that great havoc is wrought in the young orchard by mice. If the trees have not been protected by wire netting or tarred paper, the snow should be firmly trodden around their base. This is hard, disagreeable work in winter when the snow is deep, but sometimes it is very essential to the preservation of the orchard.

THE BREEDING AND DEVELOPMENT OF THE MAINE JERSEY.

By Prof. G. M. Gowell.



G. M. Gowell

One of the most difficult tasks ever undertaken by man consists in combining the blood elements of two creatures in one, and determining beforehand what that one will be like. Long ago it was learned that the law that "like begets like" was not infallible. Animals that are dissimilar in form, color, disposition and function do not often, each contribute, even halves, to their offspring. The middle ground between the two is not often secured, and in their case we say, "The law is most unreliable." There seems to be constant strife between the blood elements of dissimilar parents, for mastery in their offspring. Sometimes one controls more than the other and stamps the young in all its parts; again they seem to content themselves with a division of the spoils, and contribute in alternation the shape, color, disposition, function and other qualities. Unrelated animals that seem to be counterparts of each other in everything but sex, unite more readily, for the barriers between them are not so great. Creatures that are uniform in type and function, and of the same breed and family, come nearest to combining their blood elements in a common offspring, and with greatest assurance that like produces like. Could we be sure that this axiom would prevail under these conditions without fail, the work of the breeder would be simple indeed.

Our Maine Jersey Herd Registry has in it only animals with as pure blood, and as long lines of ancestry as any Jersey cattle in the world. We have not only kept the stock as good as it came to us but we have improved it by adapting it to our needs. We have not bred fancy animals for sale, but we have bred working animals for the working farmer—broad, rugged hipped, strong featured creatures. The aim of our farmer breeders has been to secure capacity and quality. The bringing into the herds, every two years, of bulls with fresh blood from other strains has tended to dissipate the original blood, vary the type, and defeat the uniformity of the animals of the herd.

We have bred but few families and have in but few instances attempted to intensify the blood of our best ones by inbreeding. We have rich, large producing cows that are yielding from four hundred to six hundred pounds of butter per year, on the moderate feed that our animals receive. Unfortunately, or fortunately, what their yields might be under the pressure of high feeding and expert testing, we do not know. Cows with moderate capacities, under the care and pressure that the professional tester gives, are stimulated to their utmost limits and become notorious as great producers, and the farmer, seeking for new blood with which to fertilize the herd, purchases the sons of these cows, while he or his neighbors may have in their own untested herds animals of greater merit. Food given to the cow that can digest and assimilate it must produce results, and we frequently do not appreciate the difference in the force of the farmer's grain ration of six or eight pounds and the tester's ration of from fifteen to thirty pounds, but we are apt to ascribe the greater butter yield to the quality of the cow rather than the food employed. The milk yields and fat tests of the cow on the every day feed of her life are the data upon which dependence can alone be placed.

I believe we must depend upon inbred bulls if we are to secure the transmission of the qualities of our best cows to their offspring, and I would secure my first bull by breeding the son of my best cow back to his mother, and saving the son that results from this union for service in the herd.

For best results the bull and cow to be bred together should be of the same conformation. Shall the heifer gotten by our young inbred bull in turn be served by him, and inbreeding be carried another step, so as to lastingly impress upon the young the valuable qualities of the grandam, with the additional function of prepotency, that most surely comes through inbreeding?

After inbreeding has been carried one or two steps and fresh blood is needed it is not necessary to go outside the family and procure unrelated blood for the purpose of preserving vitality, for the infusion of the blood of a first or second cousin may be as fresh and life giving as that of an alien, and the permanency of the established function of the family may be preserved as by no other method.

Inbreeding in the human family and in certain classes of animals—particularly swine—has resulted in the production of a large percentage of physical weaklings and this is probably the reason why American breeders have so generally guarded against it. In the consideration of any subject, data and example are very much more valuable than theory and speculation. To get data we have but to turn back to the breeding of the Jersey cattle Mercury and Europa—full brother and sister—son and daughter of Jupita and Alpha. This inbred cow Europa was the dam of Eurotus, who yielded seven hundred and seventy-eight pounds of butter in one year. Eurotas had good constitution and much personality. She was the dam of Pedro, who was at the head of one of the greatest herds in the world until he was over seventeen years old. This would not be remarkable were it not for the fact that in addition to his inbreeding as indicated on his dam's side, his maternal grandsire, Sarpedon, was out of an own brother and sister, who in turn were both out of the brother and sister, Jupiter and Alpha, the grandsire and grandam of Eurotus.

Another strong cow that gave seven hundred and five pounds of butter in a year was Jersey Belle of Scituate, who was gotten by the bull Victor, out of his own daughter. Princes 2d, that greatest of all Jerseys, was the result of the union of two cousins. I do not advise the carrying of inbreeding to this extent indiscriminately, for we should be working with hot blood, which with all its advantages carries its greater risks. The cooler blood that results from breeding in, only one step at a time, if slower, is safer for the common breeder.

In selecting a bull the quality of the butter of his family must not be made secondary to its amount. The firmness and color of butter depend chiefly upon the cow and I feel confident that in the future, the yellow butter cow will have greater prestige than ever before.

One of the greatest mistakes of Jersey breeders lies in disposing of the bulls while they are young and before their get is tested by work at the pail. Far too many of them are slaughtered when but three or four years of age. This is largely owing to their nervous temperament resulting in vicious dispositions, with the trouble and risk of handling them. Dehorning greatly modifies the temper if it does not completely remove all vicious tendencies. Horns on a bull are a constant menace and should be removed, then he need not be sacrificed before his breeding value becomes known.

The bull should not only have near female relatives that are valuable as producers, but as an individual he should have great width of loin and rump, and depth at flank; good length of face, neck, and thigh; skin of good thickness, but much mellowness and color; and good teats.

These conditions and markings may all exist, and yet, for reasons unknown to man, the animal may lack the ability to transmit the qualities of his progenitors to his offspring. The breeder needs to avail himself of every hint that shall reveal to him the hidden functions of his animals.

The milking cow, carrying her calf, should be supplied with food material sufficient to do her double work. It should at all times be rich in bone forming material, or the calf she is carrying may be born thin and weak limbed. Wheat bran supplies bone making material in available form to the cow and calf and is one of the most desirable of foods. It should not be withheld when the cow becomes a stripper and goes dry, for she needs it then to nourish the fœtus, and build herself up for the next period of heavy milking.

Years ago, in my early work with cows, I believed in, and practiced milking them up to within about four weeks of calving. But experience, that truthful old teacher, that comes most frequently to the dullest of us, convinced me that I not only got stronger calves, but more milk in the year, when my cows went dry from eight to ten weeks. I am aware that there are exceptional cases where cows persist in milking, if the drying process has been delayed too long. The nerve force that the cow will store up during this period of protracted rest fits her for heavier production when she is fresh again, and the increase is worth more than the stripper milk that she would have given had she been required to hold out to the end.

The young calf is allowed to remain with its dam for three or four days, then separated from her by removing the cow from the calf, and not the calf from the cow. It is dehorned as soon as the buttons can be found, when it is from ten to fifteen days old, with caustic potash, which causes but little pain and gives a smooth poll. It must receive the gentlest of treatment—no scolding and no cuffing—if it is to develop into a cow that will be in sympathy with her master's interests. Taught to eat bran, with a little linseed meal when she is from ten to twenty days old, the growth thenceforward depends upon the regular supply of warm skim-milk. Keep the calves at the barn or in the handy paddock during the first year, and do not send them to the back pasture to spend the second summer. If they are of good size and strong, breed them so they will have calves when they are from twenty-four to twenty-six months of age. If they are a little small or lacking development give them three or four months more time; it will not be lost. Persistent breeding at less than two years of age has dwarfed some fine herds, and has tended to develop the milking functions, at the expense, however, of constitution and strength.

For a long time after the introduction of Jersey cattle into America they were of one great family, or common stock. Divergence of opinion upon minor matters caused the formation of more than one association for registry. In this difference of opinion the quality or the right to registry, of Maine stock was not questioned.

The American Jersey Cattle Club invited the Maine State Jersey Cattle Association to place its animals in their books, and held them open to us for that purpose until the close of its second volume. The high charges for membership were regarded as excessive, and the Maine breeders declined the invitation. There was no question of purity of blood.

From the first, the entrance of animals upon our records has been rigidly guarded. The A. J. C. C., because of its broader name and the greater efforts put forth to popularize it, became world wide in its reputation. The M. S. J. C. Association is hardly known beyond the limits of our State. Because of lack of notoriety, its animals are salable only at lower prices than are creatures of the same merit, that are in the other registry. Some one has said "There is nothing in a name," but we all know there is everything in a name, when that name becomes a trade mark and represents quality. The "Maine bred trotting horse;" the "Kentucky race horse;" the "St. Lambert Jerseys" and many others, are names that are associated with performance, and give notoriety and value to the animals of their respective groups. I believe that the breeders of Maine Jerseys have done themselves injustice in not properly making known the merits of their animals. Such action on their part as will secure and establish the records of the production of their animals is simply justice, on their part ,and not egotism. The time is here, when we should put in form for preservation, the history that these animals are making for us every day. And when we read that history to the world, we shall secure for the Maine Jersey cow the position that by right of birth and personal performance she is entitled to. To do this is within our easy reach. Our association is composed of honorable men. We can open a book for the entrance of Fat Tests; such cows to be admitted as shall have yielded twelve pounds of fat in one week, or two hundred and sixty pounds of fat in one year. Blank applications can be prepared by the association. They should require the number of pounds of milk produced during the period and its fat content. It should be subscribed to before a justice of the peace, in the usual form, by the owner of the cow; the weigher of the milk; and the tester of the milk for fat. The expense incurred would be small; the nominal fee of the justice. I believe the accuracy of such tests could be relied upon, to the same extent that other business transactions between men are relied upon. The little trouble and small expense attending the test should be no hindrance to its application. Earnestness of purpose and unity of action among us should secure the co-operation of every owner of Maine bred Jerseys and the testing of all desirable animals in the Registry.

WHY WE SHOULD KEEP COWS, AND HOW TO MAKE THEM PAY.

By E. E. Light, Member of the Board for Knox County.

Our New England soil requires constant care and frequent replenishing of the plant food elements to maintain a profitable producing capacity. It is well understood that commercial fertilization is expensive, and that it will not fully meet the needs of the soil. It must, sooner or later, be supplemented by matter that will supply humus, to keep the ground in a condition that will make the plant food available.

The fertilizing material obtained from the feeding of farm animals, not only supplies the plant food, but also the required humus. Our State produces stock fodders spontaneously, which supply the cheapest and the best rations for farm animals, and that cannot be utilized in any other way. I refer particularly to our rocky pastures, and to such areas as produce grass but cannot be cultivated. They can be profitably used as permanent pastures that will annually produce tons of butter, wool or beef. Within a decade, much of this kind of land in our State has been abandoned to grow up to bushes. There are abandoned farms that could be profitably used as permanent pastures. This would improve the condition of individuals and communities.

About the crudest kind of farming, is to cut the grass on a farm and sell it as hay. To convert that hay into a commercial article by feeding it to animals opens the door to a world of skill, study and business in breeding animals, in feeding them, in the care, making and marketing of their products, and in the development of the farm as the result of abundant fertility. Those sections of our State that have reduced their farm animals, and sold hay, find that they are approaching a condition of poverty in fertility and financial resources, while the sections that have fed their hay on their farms find them producing as much or more than ever, and their resources are increasing in every way. This being the effect of keeping plenty of stock, then the question arises, What kind of stock shall we keep? The leading stock of Maine must continue to be neat cattle. Horses, sheep and swine are each valuable and profitable under special conditions but for general conditions and for extended increase they must be subordinate to cattle.

We must depend on cows to increase the number of our farm animals, and also to increase our dairy business, which has been our aim for several years. The prospect for larger demands and better prices for all kinds of dairy products, is better than it has been for a long time. The prices of all classes of neat stock are tending upward, and the town that can show the largest number of animals, is also showing the greatest prosperity. We never can make Maine the dairy State she should be, in magnitude, nor in the quality and reputation of her goods, until her cow population is very largely increased. Instead of two, three, or four hundred cows per town as is now shown by the assessors' books, there should be ten, twelve or fifteen hundred cows. It is the great need of our creameries to-day. There are not cows enough; there is too much territory to go over in order to maintain the business.

We believe that the food required to make a pound of beef will produce a pound of butter, using average animals in both cases, and the butter will usually bring three times as much as the beef. The eighteen or twenty pounds of skim-milk obtained with each pound of butter will equal about three pounds of grain for stock. I am of the opinion that a given area of country fully stocked with cows for butter-making, will produce as many pounds of meat products from its veals, beef cows, swine and poultry as it would if it were equally stocked with beef-growing animals.

The demand for the milk of cows is increasing as the population in cities increases. The cities need more butter; more milk is being condensed, and a great deal is now needed to supply the demand for sweet cream, which is a large and increasing business. We are not keeping up with the increasing demands on the cows, in this country, and the oleomargarine people are assisting us all we will allow them. Were it not for their help butter would at the present time be higher than for years. We are not supplying all the demand there is for well-bred milch cows in the Brighton market, nor for the special purpose butter cow, at home and abroad.

Any farmer is safe in breeding and rearing for sale large milking or good butter-producing cows. As an industry, the business of rearing good cows for market is now very promising. The keeping of more cows for their milk, for cheese-making or butter-making, public or private, is now very encouraging. The price of butter and cheese is higher, and it will advance as surely as will that of other commodities. Creameries are in need of more cream or milk to give better returns to patrons by economizing in collecting and in making the butter, and in better meeting the demands of the trade.

"How to make cows pay" is the important question with every farmer, and it cannot be answered in a single sentence nor in the same manner for every inquirer. Viewing the cow as a machine to convert food into profitable milk, we must have a good machine,—that is, one that is healthy, and adapted to the work. If to sell milk regardless of quality, a big milker is needed; if to sell cream to a creamery, then a cow that will give rich milk and as much as possible, and the same qualities are needed for private dairying. A persistent milker is necessary. She should not take too long a vacation. Learn what every cow is doing by very often weighing the milk and testing samples of it. You will meet with surprises but you can rely on the evidence given. Breed up by using the best possible sire you can obtain. In breeding bear in mind that the bull is one-half of the herd. If the bull is of better blood and lineage than the dam, the issue will probably be an improvement. Raise the calves for cows, with care. Feed cows well, that is, enough to satisfy their wants and have them still retain good appetites. With the knowledge now obtainable it is not difficult to know what to feed, and in what proportions, to get the best results. Balanced rations are necessary and profitable. But I would urge that all cattle-foods, as far as possible, be produced on the farm. The original way of keeping cows in summer on pasture, and exclusively on English hay in winter, will not do now. We should depend wholly on the pasture only for about an average of ten or twelve weeks each season, and be prepared to supplement the pastures with a soiling crop of peas, oats, sweet corn fodder, rowen and ensilage, and in winter we should have early cut hay, clover hay and ensilage, with mixed grains of home raising, for rations. In feeding, study to supply sufficient protein, and if grain has to be purchased it should be mainly that rich in protein, such as cottonseed meal, gluten meal, bran, etc.

Many ordinary herds of cows could be greatly improved by wise and proper feeding. The Kansas Experiment Station employed a farmer, not a dairyman, to purchase a herd of scrub cows and compared the record of twelve of them in 1898 with the records of eighty-two herds owned by creamery patrons in one of the leading dairy sections of that state, with the following results:

	College scrub herd.	Creamery patrons' herds.
Average pounds milk per cow	5,707	3,441
Average pounds butter-fat per cow	238	104.5
Value of butter-fat per cow	$37.75	$19.79

The same price was allowed for butter-fat in both cases. The greater yield of the college scrub herd was attributed to balanced rations with plenty of protein, to kindness and shelter, and to extra feed to help out the dry pastures. Comparing individual cows of the college herd we find that one cow produced 9,116 pounds milk, containing 383.7 pounds butter-fat, at a cost of .08½ cents per pound. Another cow produced only 3,583 pounds milk, containing 135.7 pounds butter-fat, at a cost of .197 cents per pound.

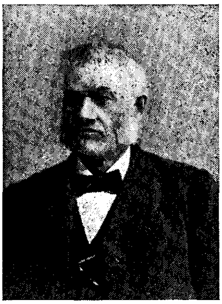
Comfortable conditions are necessary, as the Indiana Experiment proved; cows well sheltered and kept comfortable ate less food, gave more milk and retained their weight 10% better than when exposed. Cold winds, cold rains, cold barns and cold water will surely reduce the milk flow below the profit point. Flies are another source of discomfort that should be carefully attended to, not once a week but each day, else loss is the result. Cows have to be supported 365 days in a year, and they should be expected to earn something at least 300 of those days. It is not so much a question of when should they be earning as when should they be taking a vacation. We prefer it to be when butter is lowest in price, and when the cows can be kept at the least trouble and expense, and when we are the busiest with other duties, all of which seems to be in the early summer. I believe that a cow can be made to produce more in a year by freshening in the fall. Our summers are too short to permit of getting enough from cows to pay for their pasturage and care, and their board on good hay or fodder during the long winters. It may, however, be as profitable as it is to keep young stock through our long winters without gain, in order to get the summer growth in pastures. We should so feed and care for our stock that some gain will be made each day.

Regularity in dairying is profitable, for cows if milked at regular hours will give more milk. The Oregon Experiment Station made a series of experiments on this point: Two lots of six cows each, were all fed and tended the same, excepting in the regularity of milking, of which one lot was milked punctually at regular hours, while the other lot was milked irregularly, varying the time as much as two hours for each milking. These two lots were practically the same in average age, period of lactation and total yield of milk at beginning of experiment, and in three weeks' time the lot regularly milked gave 5.9% more milk and the other lot decreased 4.4% on milk yield. Regularity in feeding and watering is also necessary. Whatever the habit that is established, whether it be feeding twice a day or more, should be closely adhered to. The cows will look for their food at the regular time, and they should not be disappointed.

In this State, our cattle foods are more costly than in most states that we are brought in competition with in dairy products, therefore constant effort should be made to reduce the cost of the cow foods. Instead of feeding mainly $10-per-ton hay, we should replace a portion of it with ensilage, when it can be raised cheaply by machine labor. Instead of supplementing a poor pasture with purchased grain, we should raise peas and oats or corn fodder. Instead of buying fattening foods like corn meal, for cows in milk, we should buy milk-producing foods like bran, cottonseed meal or gluten meal. Buy the kind in which the guaranteed protein costs the least per pound, whatever its name or form. Make the business as self-supporting as possible by raising as much of this class of foods as your circumstances will warrant. Much disappointment in dairying is due to utterly disregarding these points. To keep good cows, and to feed them well and also cheaply are absolutely necessary. To observe all the conditions that make cows comfortable and productive will call for skill, and care, and to manufacture and market the products will call for business ability, and the reward will be as large in this industry as in any agricultural industry, in proportion to the effort made. The resources of the farm will increase, its fertility will be preserved and our rural communities will keep pace with the progress which is being made in industrial and manufacturing centers.

PRINCIPLES AND PRACTICE IN BEE-KEEPING.

By L. F. Abbott, Lewiston, Maine.



Lyman F. Abbott

Bee-keeping is a science having for its object the attainment of a correct knowledge of the habits and instincts of the bee; it is a practical art and these attainments are the only reliable basis of successful bee-culture; hence, the necessity of becoming acquainted with the laws which govern these wise little insects.

The bee has never failed to attract the attention and study of all naturalists, and of all who feel an interest in the works of nature. Its skillful work seems to manifest the intelligence in some respects, the intellectual faculties of man.

In a perfect colony of bees, there are three kinds: The "queen," the mother of the whole colony; the "workers," of the neuter gender, those that do all the work; and the "drones," the male bees, who take up room in the hive, live on the products of the workers, but bring in no honey. These three kinds of bees have very different organizations and instincts, and their offices in the hive are entirely different, yet each is necessary to the other, and all are indispensable to the existence and continuance of the colony. The queen is a fully developed female. In all animated nature, we usually find the male and female of about the same number, but bees are an exception to this law. Here there is but one female to many hundreds of males, and many thousands of workers which are of neither gender.

The queen has a sting which she uses only to sting another queen, and principally these are of her own household, hatched from eggs laid by herself. A queen may be handled without any more fear of being stung by her than by a drone which has no sting. She lives four or five years, if no accident happens to her; but in the latter part of her life she ceases to be prolific, and the colony proceed at once to raise another queen to take her place. The office of the queen in the hive seems to be only to lay eggs. She has no care for them after they are deposited in the cells, but all such as the workers convert into queens she is sure to destroy, unless in some way prevented, if she does not go out with a swarm before the young queen is sufficiently advanced in its cell to be regarded as a rival.

The queen possesses the power over her ovaries so that she can lay eggs or not, as circumstances in the hive make it necessary. The function to lay either drone or worker eggs is under her control. A queen in a large colony, when honey is being brought in abundantly, will lay five times the eggs that the same queen would in a small colony under reverse circumstances. Upon this fact is founded the theory and practice of feeding bees to induce the queen to lay, and build up the colony. A mysterious fact may be mentioned here, which is, that the egg from which a queen is reared is hatched into a perfect bee in sixteen days from the time it was laid, whereas, if a worker had been reared from that egg it would have taken twenty-one days. The drone requires twenty-four days from the egg. Another remarkable thing in this connection may be mentioned; that is, the great fecundity of the queen bee. Instances have been known of a queen producing 2,000 eggs a day for a considerable length of time. An experiment was instituted under the direction of the U. S. Department of Agriculture in which a record was made as complete as the nature of the experiment would admit, of the egg-production of a single Italian queen bee in a strong colony of bees, and the average was found to be about 800 eggs per day for the season through.

Calling the active season four months, this would make about 24,800 eggs per month, and very nearly or quite, one hundred thousand for the season. Another curious fact is, that all worker eggs may be made to produce queens, and upon this fact hangs many and varied processes in bee-culture. Upon it is based artificial swarming and queen rearing, which, by many bee-keepers, is made a special line in apiculture.

As to races of bees it may not be amiss to say a few words. In the years of my first experience in bee-keeping, the common black bee, usually called the German bee, was the only variety known in this country. That was about fifty years ago. It was five years previous to that date, 1843, that the Italian bee was discovered in Northern Italy by one Captain Baldenstein during the war of Napoleon III. Ten years later they were introduced into Germany, and in 1860 into the United States. From that time to the present, the Italian bee has been bred with a view to improvement and it is conceded by bee-keepers of Europe, that the Italian bees produced in this country are the most beautiful race of bees in existence. The honey bee is not a native of this country. It is supposed it was introduced from Spain in the early years of Spanish conquest in the South. These two races, what is commonly known as the native or German black bee, and the Italian, are the prevailing races to-day. There are other races, however, which have been imported from the countries which give them their names. Among these are the Cyprian bees, the Holy Land bees, Carniolans, and one or two others, but the Italian, by far, supersedes all others. The points of superiority in the Italians are, their beauty, docility and activity. The bee-moth cannot exist in an Italian apiary. It is generally admitted, I think, that the black bees produce whiter comb honey than the Italians, and are less inclined to build drone comb, but this latter does not count when we use comb foundation.

Bee-keeping as a pursuit may be regarded from two standpoints—that of the man who, with income assured from other sources, pursues bee-keeping for its pleasure; and that of the man, who, wishing to increase his slender income, or actually make an income, turns to bee-keeping with a view to profit on the capital and labor to be invested. Bee-keeping as pursued to-day, has become a specialty in some sections of the country and to some extent in our own State. Apiculture is now a study, and the conditions which govern one season, or one colony of bees, may be completely changed for the next. Every stage in the life of a colony of bees needs to be understood. Hence, the one who enters upon the pursuit of bee-keeping must be alert, with eyes and ears open, always prepared for emergencies, prompt to do what is necessary, and one who is not easily discouraged. Emergencies will occur needing heroic treatment, but the bee-keeper with mind and hand trained by experience and thoughtful consideration of the business, will rise superior to any occasion, and when discouragement comes, as it inevitably will, in the words of the immortal Longfellow, "He will look not mournfully into the past, it comes not back again, but wisely improve the future, for it is his."

To attain to the highest success with bees as measured by present day standards, necessitates the use of movable frame hives. There are various forms of hives which carry movable frames, these latter being of diverse size. Also there are various forms of hives which carry the same frame. While uniformity in hives, on some accounts, is desirable, it is much more essential that there be uniformity in the size of frames. And also it will frequently be highly convenient to adopt that size of frame which is most largely used by bee-keepers throughout the country. Probably the Langstroth size of frame is used by more bee-keepers than all other sizes put together. The Hoffman frame is now largely used and possesses several advantages over any other frame. There are several modifications of the Langstroth frame but all retain the original outside measurements—17⅜ x 9½ inches. Eight of these frames in the body of the hive, usually termed the "brood nest," contain about 2,000 cubic inches, which at the time Mr. Langstroth invented his hive and frame was considered about right. Later investigation and experience has shown that as a rule 2,000 cubic inches affords too much room in the lower story of the hive for the best success in the storage of surplus honey in the sections above. It must be borne in mind that running an apiary for comb honey requires quite different management than when running the whole or a part of the colonies for extracted honey. In my experience I have found it a good plan to adopt both systems when six or more colonies are wintered, depending somewhat upon whether it is desired to increase the size of the apiary; for those colonies extracted will not swarm, but if the bee-keeper is expert enough these abnormally large colonies at the close of the honey harvest, may be divided, and a laying queen furnished to the queenless part. By feeding for winter stores, if the goldenrod does not provide a sufficiency, and doing this early enough so the queens may be induced to lay and thus raise up a succession of young bees to fill the places of the old ones which must inevitably die off ere the following winter is passed, such late divided colonies may be put in condition to winter.

In planning, then, for hives, it is well to have the body or brood nest large enough to take ten frames, then the upper story, which should be made with movable cover and same depth as the lower portion, will take twelve frames. When running for section or comb honey, the lower story may be restricted to seven or eight frames by the use of dummies or division boards, and the upper story will easily accommodate two section cases holding twenty or twenty-four sections each. The original Langstroth hive and the modified form in the Simplicity hive, made by the A. I. Root Company, had fast bottom boards. Were I to begin in bees again I would have all bottom boards movable and transferable or interchangeable, and fitted with some simple device to fasten to the hive so as to be convenient in moving the hives.

As a rule, surplus storage is best arranged on top of the hive. Bees will more readily pass upward into the sections than at side or rear, an obvious reason being that heat rises and the top sections are warmer. I have said that seven or eight frames, Langstroth size, are sufficient for the brood nest. There are exceptions. One must be governed partially, as to amount of room, by the quality of the queen. A prolific queen will often fill ten frames with brood as easily as another will seven frames. One of these prolific queens restricted to seven or even eight frames will be very likely to go up into the section case and deposit eggs in the sections, which makes a bad mess. It is well to use a queen excluder which will prevent such a mishap, but as it is numbers of bees in the colony at the time of honey flow that is wanted, the queen should be given all the room she will occupy and no more, for if extra room be furnished below, the bees will store honey there, filling the spare room before going above into the sections.

In running colonies for extracted honey, it is well to give the queen all the room available below, if it is ten frames; then use an excluding board to keep the upper set of frames clear of brood. The chaff hive as formerly made by Root, makes a good all around hive for the beginner in bee-keeping, because he can winter his bees out-of-doors; the facilities for running for section or extracted honey are ample and good. By using the queen excluder it is not necessary to disturb the lower portion, or brood nest, when extracting.

In my later experience I found it much less work not to disturb the lower tier or brood nest combs. Having the queen confined to the lower apartment by the excluder, obviated the trouble of hunting her up and caging her. The amount of honey obtained from the brood combs was usually not enough to pay for the trouble. By this method of running an apiary for extracted honey, you secure a large amount of honey and double your stocks, or make as much less increase as you choose. A given number of colonies will yield one-third to a half more honey by this plan than by an exclusive limit to comb honey. The difference as to profit depends upon your success in marketing it.

That increase of colonies is incompatible with the largest honey production, is an axiom to be kept in view in bee-keeping. How to control, or partially control the swarming impulse has been the study of apiculturists for years. It is generally conceded that for largest comb honey production, natural swarming is preferable to artificial swarming. Both methods are of value, and often a union of the two methods are necessary. There is no sure, feasible plan to run an apiary for comb honey without an increase of colonies of fifty per cent, or more. My plan is to let each stock wintered cast a swarm, then prevent, if possible, all after swarms, unless larger increase is desired; if so, the line is drawn at the second swarm. In the former case the issuing swarm is hived and placed on the old stand, and the old hive removed some distance away. The section case in which work will probably be somewhat advanced, is transferred to the new hive. The old hive will be likely to contain a dozen or more queen cells in various stages of ripeness. In four or five days open the old hive and, taking out the frames one by one, shake the adhering bees down in front of the new hive. The probabilities are there will be no queen at liberty in the old hive at that time. If there is, the fact may be known by the piping of the queens, which may be distinctly heard by placing the ear close to the outside of the hive. In that case it is best to hunt up the young queen and set the frame on which she rests one side, then go on with the shaking process. Cut out all the queen cells but one if no queen has emerged, if there has, cut all from the hive. As a rule there will be no more swarming from these two hives that season. Give the new hive all the surplus room they will occupy and as fast as they will occupy it.

Now there may be a liability that this young queen in the old hive may be lost before she comes to age to assume maternal duties. If in twelve to fourteen days after the swarm issued she is found present, even if no eggs are found, it may be assumed that she is all right. But, if at that time neither the queen nor eggs can be found in the hive it may be concluded that the colony is queenless, and no time should be lost in furnishing another. The preferable way is by purchasing a laying queen of a queen breeder, to be sent by mail, or having such raised in your own apiary for such emergencies. Managed in this way the probabilities are that neither hive will swarm, but the new hive getting in the old one's place, containing the old queen, must be given all the sections they will occupy and as fast as they are filled and nicely capped, these must be removed and empty ones put in their places.

June is the great swarming month for New England, and the one which will decide, to great extent, whether the season will be a profitable one or otherwise. Ordinarily, we should expect strong stocks to store some surplus honey in May and early June. This will depend much upon the strength of the colonies when the snow leaves the ground and the willow catkins grow, as well as upon the amount of fruit bloom. Plan to have as strong stocks as possible from early spring till haying commences. After farmers have cut their hay-fields the honey harvest is over until the fall supply from goldenrod comes, which, as a marketable product, is of small account in our city markets. But usually winter stores, sufficient for the needs of the apiary, are secured from this source; if that falls short, sugar syrup should be fed in September to carry the bees through the winter.

Every means should be used to induce the bees to store in sections all the honey possible from fruit bloom and the clover harvest; in some sections of the State basswood bloom is of account, which comes in July.

The novice may ask, When is the best time to begin in bee-keeping? Two considerations should be taken into account in answering this question; whether one has any previous knowledge concerning the life history of the bee, and the amount of money he is willing to put into the business, looking for a good part of his returns the first few years in the pleasure and interest afforded in the study of these wonderful little insects. Really, the best time to commence in bee-keeping is in the spring, by purchasing one or two stocks, as then one may secure an increase of bees as well as secure some surplus honey the first year. The least expense is incurred by commencing in June or July, by the purchase of one or more nucleus colonies; that is, send to some reliable dealer in bees and queens—we have quite a number in Maine—and buy, say, two of these little colonies. In the first place get some good text-book on the subject. The A B C of Bee-Culture, by A. I. Root, Medina, Ohio, is one of the best, and gives explicit directions for the various manipulations incident to successful bee-culture, besides a great amount of reliable information concerning bees, their habits and natural history.

A nucleus colony consists of one or more frames of brood with adhering bees, a fertile queen, and it may be an additional frame of sealed honey. A hive will be needed of sufficient size to carry the frames of your nucleus colony. The little colony will be shipped to you by express in a miniature hive, the usual size being adequate for two or three frames. In regard to choice of hive, the Root chaff hive, or Simplicity by the same maker, carrying the Langstroth frame, the former to winter out-of-doors, the latter in the cellar, are the ones I would choose. A stand will be needed on which to set your hive. This may be made with two pieces of 2 x 6 joists as long as the hive is wide with two narrow strips of board nailed to them. A board should be placed at an angle of forty-five degrees from the ground to the entrance for an "alighting board."

Select your site for your bees and place your hive or hives upon it, so that when your nucleus colony or colonies arrive they may be transferred to the full-sized hive at once, if they arrive before 4 o'clock P. M.; if later, better wait until next morning before placing them in their future home. Most persons have a natural dread of coming in contact with bee stings. These small colonies after their shaking up by transportation, rarely show any signs of anger and seldom sting unless one accidentally puts his fingers upon them in handling the frames. Yet to the novice it is unpleasant to have a thousand or two bees humming around his ears in the air, and many alighting upon his person, so a smoker and bee veil should be provided. A smoker will cost from fifty cents to $1.25. Dried toad-stools, or rotten wood from the forest or orchard, thoroughly dried, make good fuel for the smoker. The fuel should be such as will light readily from a match, and save trouble of going to the stove for a live coal. These are seemingly small things, but they are among the essentials in handling bees, as experienced bee-keepers know, and the novice will soon find out.

Now to get the bees from the nucleus hive into the large one, set the former down in front, close up to the hive. The reason for this will be plain later on; inject a few puffs of smoke among the bees crawling upon the wire screen which covers the little hive. Gently remove the tacks from the screen with a screw-driver, and immediately the air will be full of bees, but every one will mark the exact location, and however far they may stray away, they will all return and find the way through the entrance of the hive to their companions. You now lift out the frames of bees and brood one by one, and place them in the central portion of the new hive. Place a division board upon each side, place on the covering; shake the remaining bees from the nucleus box in front of the hive and carry it away, and the little colony will settle down to work, contented and happy. As the queen fills the combs with eggs, to give her more room push back division board, on one side insert a frame filled with foundation, and add others as their wants seem to require. The cost for the above outfit will be about as follows: Langstroth hive complete, painted, brood frames wired and filled with comb foundation, one section case with sections with light comb foundation with separators, $2.70; two-frame nucleus colony with untested Italian queen, $2.50 to $3.00; smoker 85 cents; bee veil, silk front, 75 cents; total, $7.00 to $7.50. Hives in the flat with frames without foundation, can be bought very low,—from 50 to 65 cents. Comb foundation for brood frames costs about 40 cents a pound; lighter for sections, 45 to 50 cents.

The wintering problem is one of the hardest to solve in the keeping of bees. The advent of the movable combs has added to the difficulty, inasmuch as by their use the normal or natural conditions of the brood nest are changed. Bees left to carry out their plans according to their instincts seldom fill the hive with straight combs from front to rear. By building angular sheets of comb larger spaces are afforded at corners and ends of sheets which afford more space for the bees to cluster in and thus the requisite warmth is easier maintained. But with the movable frames affording only straignt passages from front to rear the bees are isolated and numbers die from being chilled and from want of companionship. What seems to be most necessary in the conditions for successful wintering is protection from atmospheric changes. This may be attained by chaff hives or by wintering in the cellar, or other underground apartment. These conditions also include colonies that are healthy, and strong in numbers with an abundant store of honey; upward ventilation to the hives; easy communcation from comb to comb, and if out-of-doors, the hive entrances sheltered from piercing winds and the direct rays of the sun. Experience seems to have demonstrated that we may reasonably hope to get small and rather weak swarms that have an ample supply of good quality stores in their hives, through to April in the cellar when, if wintered out-of-doors, they would be quite sure to die.

But given strong, healthy stocks with plenty of stores, taking into account the vicissitudes of getting through the unfavorable weather of April and often first ten days of May, which tells so unfavorably upon cellar wintered stocks, and it is a question in my mind whether the risk is greater to winter out-of-doors than in a good cellar.

It is pretty well settled, that in our Maine climate where the mercury frequently drops from fifteen to twenty-five degrees below zero and continues for days together at zero and below, that some more protection to our hives is needed to winter bees successfully out-of-doors, than the ordinary single-walled hive affords. Perhaps it may not make so much difference whether the hives are so constructed as to

HEREFORD STEERS. PROPERTY OF C. O. DILL, PHILLIPS.

afford a dead air space, two thicknesses of walls, chaff or leaf-lined, or encased with some improvised outer covering; the main thing to be attained is some protection from the intense cold and the sudden changes of the atmosphere.

A question of much importance to the bee-keeper is how to market his honey advantageously. Put the honey upon the market in neat and attractive form; inspire confidence in its genuineness by having the producer's name back of it as well as its own truth-telling good looks. Small and medium-sized packages, neat and above all tight so as not to be leaking the contents and daubing everything they come in contact with, full weights and pure quality will command a fair price when the same goods might go begging for a sale when wanting these requisites.

BEEF GROWING IN MAINE.

By Hon. John M. Deering, Saco.

I would like, first, to review the history of our live stock industry for the last few years, to show why the part pertaining to the beef interest has run down to such a low ebb, not only in Aroostook county, but all over the State and country. The prices of our beef and dairy products, together with the customs and demands of the consumers and other conditions have, within the last fifteen years, divided our beef and dairy interests into two distinct industries. And it is apparent by close observation that the beef-growing interest has suffered a terrible depreciation.

About the year 1887, the price of beef commenced to fall, and continued to go gradually lower during the next five years, and during this period of low prices of beef, the steer lost his friends, and the fine Durhams that once graced the hillsides of Maine, grew fewer and fewer in numbers, and the farmers found themselves short of beef-producing animals. Now as to whether we are better or worse off, financially, than we were twenty years ago, when we were well supplied with beef-producing animals, there will be a wide difference of opinion, yet I am inclined to think that before two years, the farmers of Maine will see that they have made a mistake in letting this important part of our live stock industry slip through their fingers.

About the year 1880, dairying took a boom. Gilt edge butter was selling in the leading markets at from 40 to 50 cents per pound. Farmers, not only in the East but in the West, saw this, and as the prices of beef commenced to decline, the farmers were quick to discern these things, and commenced to turn their attention to dairying. This was slow, at first, but soon the tide commenced to turn, and farmers all over the East and West were pushing their beeves off to market and did not raise others to take their places, but went into dairying. More butter factories were built and put in operation during the 80's than ever before in the history of the country. And while this was going on, farmers everywhere were selling their steers and glutting the markets. Beef was bought at the butcher's price, and under this state of things the Chicago beef men sent their agents into foreign markets, and upon the influence of these low prices they established the reputation for American beef. And all the while they were building up markets for American beef products, the farmers were letting go of the industry.

The demand has increased 25 per cent, and all the while the demand has been increasing, the beef-producing animals have been growing less. According to the Agricultural Department report, there were in the country in 1890, 36,849,024 cattle. In 1899, there were 27,994,225, a loss of nearly ten million. On January 1, 1890, we had 589 cattle to every one thousand population. January 1, 1899, we had only 373 to every one thousand population; nearly 25 per cent. less, without taking into account the increased foreign trade.

How about the State of Maine? In 1850, there were 343,339 cattle, of which 83,893 were oxen and steers; in 1890, there were 299,110, of which 33,105 were oxen; in 1899, there was nearly the same number of cattle, of which there were only 8,900 oxen.

Now during the hard times, we did not notice the shortage in beef cattle, but when business commenced to start and the people began to earn more money and had more to buy with, the demand increased rapidly, and soon we were aware of the fact that we were short of beef animals. Now we find ourselves with practically no beef to sell, and prices high. Well, what are we going to do about it? Can we build up this neglected industry or not? Let me say right here, that the whole agricultural press, and the speakers and the breeders of dairy stock all over the country, have put their influence and best efforts into building up the dairy interests. Not a stone has been left unturned in behalf of this industry, and with all that has been done, we have only and barely kept up with the demand for dairy products. Dairy products are at present bringing good paying prices, and I would not advise any one that is well established in the business to change from dairying to the growing of beef. But all farmers are not well established in the dairy business, neither are they all educated in the fine points which are absolutely necessary in order to make the business a success. Taking all things into consideration, the indications are that the margins of profit between the beef and dairy interests will become more even in the future, giving to those farmers who are not favorably situated as to market facilities and do not have a liking for dairying, encouragement to increase and build up their beef herds.

The farmers of Maine will produce, generally, what pays them the best, and if dairying pays the best, they will make butter. If beef pays the best, they will grow beef. But my advice is to do both.

Not a drop of Jersey blood should run through the veins of a beef-producing animal. If we are going to build a steam engine, we must have iron and steel. If we are going to build a wooden block, we must have wood. If we wish to grow a good paying beef animal, we must have a beef-producing breed. What breeds are best adapted for this purpose? There are a number of good beef-producing breeds. Let us take them up in line, and discuss their merits and see which would be the best for us to accept. The Holsteins will do fairly well under favorable conditions. There are a great many different families among these cattle, and some families are better for both milk and beef than others. I have had considerable experience with this breed, and own quite a herd now. I like the Mercedes families; they are generally fine cut, not over large, fine looking animals. They have square well-formed udders, and are good sellers in the market. The young calves are thrifty. It is no uncommon thing to sell one of these calves from four to six weeks old for ten or fifteen dollars. I have sold cows at from sixty to seventy-five dollars, on account of their good looks and milking qualities. This breed is practical and all right when the owner is situated near a city and has good facilities for selling milk. But it is my opinion that this breed requires a longer time to develop and become a finished beef animal than some other breeds. Yet upon the whole, they are a good class of cattle. But the beef will cost more per pound than beef produced from some other breed.

The Hereford is altogether a different animal in many respects from the Holsteins. It is a natural beef-producing animal, fine cut, small boned; they will produce more meat to the bone than any other breed that I have ever seen or handled. If I were going to make beef a specialty, I should accept this breed. They develop into a finished beef animal at two years old, with proper care and feed. They are tough and hardy and good feeders. And it is my opinion that a pound of Hereford beef can be produced at least from one-half to one cent cheaper than a pound of Holstein beef, which is a good profit in growing beef; yet we must keep in view the extra amount of milk the Holstein will give us.

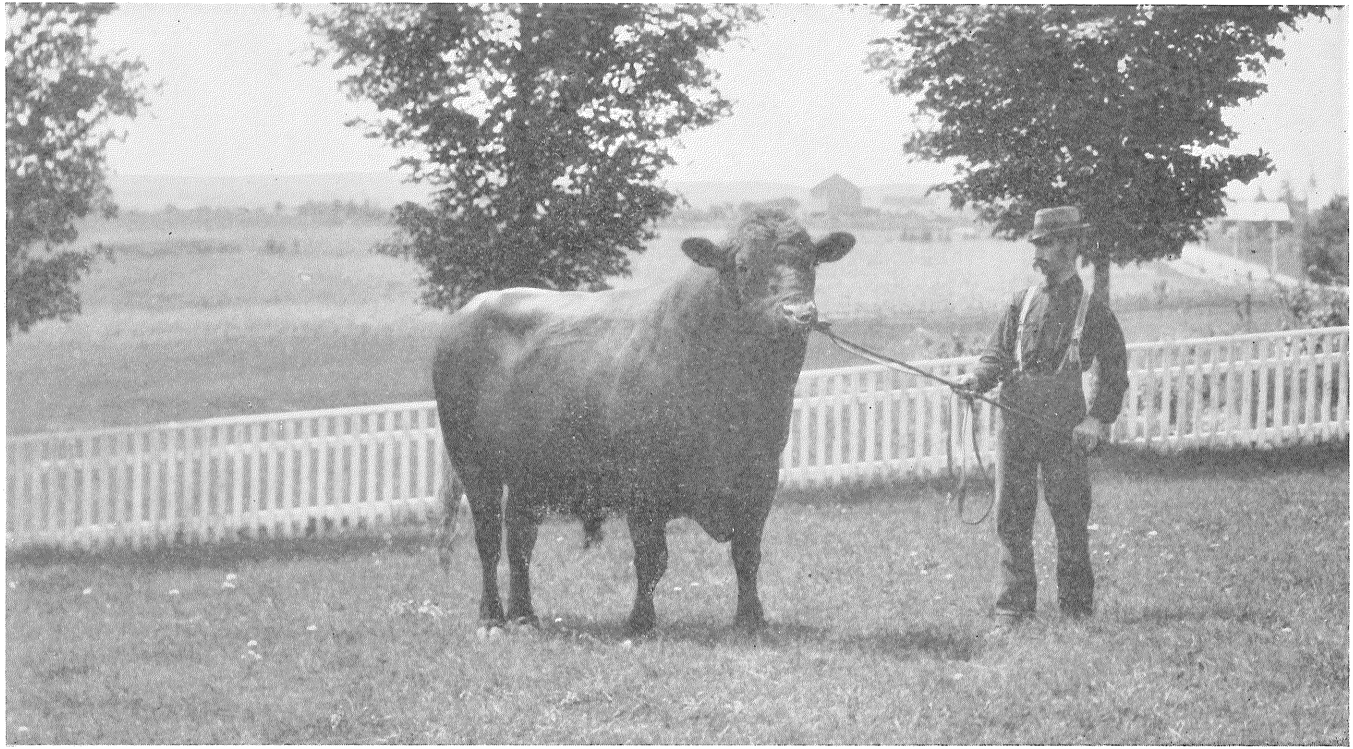
There are several other good breeds of cattle, the Swiss, Polled Angus, and Durhams, breeds we are fairly well acquainted with, and among these breeds we must look for a cow that will produce milk and cream and a good steer calf.

With the present demand for dairy products and the present and increasing demand for beef, the general purpose cow will be the most profitable animal to the farmers of Maine for the next ten years at least.

What about the Durhams? I am inclined to think that we can find more of these cows in this breed than any other. This breed is strong and healthy, as a rule, good feeders and of pleasant disposition, with good graces and good shape, fairly good for milk, cream and butter and has more qualifications for all purposes than any other breed.

It is my opinion that we made a great mistake in letting this breed go by as we have. And the sooner we turn our attention to it the quicker we shall get into position to meet the demands of both beef and dairy production with the present condition of prices and the future prospect, all in our favor.

Now, as we have settled upon the characteristics of the different breeds, let us grow a few steers. How will we raise them?



RED POLLED BULL. PROPERTY OF HERRICK FARM, ORONO.

Will we send our money out to Nebraska and Texas and freight into this State corn and cottonseed meal to grow these steers upon? I say, no. There is no necessity for this. We can grow just as good oats, barley, peas and wheat as can be grown in any State in this country. In these four grains we will have all of the food elements that we need to grow a well-finished beef animal.

I cannot lay down a correct food ration. The steer must be fed upon a ration in accordance with his weight and assimilating powers, and the feeder must use his judgment when to increase the grain ration. I will give my opinion upon how to grow him up to three months old. I would let the calf feed upon its mother at least two months. I would put oatmeal near by him, in order to teach him to eat and I would keep it by him, and I would commence it when he was two weeks old.

When he was two months old, I would commence to gradually wean him off, and I would continue this for one month. In this manner, the calf hardly knows when or how it is being done. Under this manner of treatment he does not experience any radical change, consequently he keeps right along growing.

Now, I have no actual experiments of late date of my own to put in here, because I am like many other farmers. I stopped some time ago keeping figures with the steers, but my experience leads me to believe that steers can be raised at a profit at four cents per pound in any county in the State of Maine.

The day is coming when the fine-cut beef-producing animal will grace the hills and valleys of Maine, and instead of our State being strictly a dairy State, it will be both a dairy and a beef-producing State.

REPORT OF PROCEEDINGS

OF

STATE DAIRY MEETING

Held at Lewiston, December 12th and 13th, 1899.

ADDRESS OF WELCOME.

By Mayor GEO. E. POTTLE.

Ladies and Gentlemen: It is my pleasant privilege to extend to you the hearty welcome and greeting of the people of this city. We certainly rejoice that you are to hold this meeting here in Lewiston, the home of the Maine State Agricultural Society. While our people here in the city, a large portion of them, are engaged in various manufacturing industries or in trade, yet at the same time they have as vital an interest in the discussion of matters which will come before you as those of you who are engaged in agricultural pursuits. This is the age of progress; improvement is the order in every business enterprise, in every vocation of life. People are not satisfied to do as their fathers have done. They are reaching forward for something better. They are learning that the prosperity of one industry assists in the prosperity of all. It is gratifying to note that the methods of agriculture in the State have kept pace with the times. Through the active agency of the Board of Agriculture, through the good influence of the Grange, and the co-operation of the public press, people upon the farm are no longer living isolated lives. They are brought nearer together, they are brought in close touch; and as great as have been the strides in manufacturing industries, I think they have been no greater than those that have been made in agriculture. I trust that you will find this a most profitable session, and above all I hope that the people of Lewiston who have an equal interest in these matters, in the matter of pure food, in the matter of improved dairy products, will avail themselves of the opportunity to be present at this meeting.

RESPONSE.

By Secretary B. W. McKeen.

Mr. President, Mr. Mayor, Ladies and Gentlemen: It certainly affords me great pleasure to stand here in this magnificent hall of the most magnificent city of Lewiston and respond to the address of welcome delivered by its mayor. I agree with him that attempts have been made all along the line to keep the agriculture of the State in close touch with the advances of the age. We have endeavored, by every possible means, to so advance the work upon our farms and so improve the conditions of our farm homes that we shall be in the very forefront of the march of progress. It is gratifying indeed to note that the agricultural interests of our State are welcome in this great city. It is gratifying indeed for us to have this beautiful building turned over to us for our free use for this meeting, and I certainly hope that through the good influence of the mayor of the city, and of the press of the city, the people here may feel to come in and to see the products of the farm and of the dairy as they are here exhibited. We hope that the program which shall be presented to you during this meeting will be of interest and of value to you all, and that when we go away from this, the first meeting of the kind in the city of Lewiston, we shall go away with better courage, with more enthusiasm, and work out more clearly and more definitely, than we have in the past, the great problems relating to our agricultural interests, and our dairy interests in particular.

We certainly appreciate very fully all the good offices of the city and of the mayor, and we recognize the benefit that we have obtained from the press in our work, and we hope that our labors may be conducted in such a way that these good offices shall be continued.

OUR DAIRY WORK.

By Prof. G. M. Gowell of Orono.

Mr. Chairman, Brother Dairymen and Creamerymen: It is my privilege to again come before you to talk about the great industry that we are all so closely associated with. As a whole, the past year has been a prosperous one to the dairymen. In the western and central parts of the State, many localities suffered severely from drought, and short pastures and scant mows were discouraging features to the farmers, but the yields in most of the sections east of the Penobscot, were quite up to or above the average.

Other dairy states suffered from similar causes and the prices of butter and cheese have ruled much higher than usual during the last six months. The data obtained from the creamery returns indicate that the year has yielded as great a revenue through its dairy products as did its predecessor. The shortage of hay in some sections resulted in the sale of many animals, but it is doubtful if the dairy herds suffered severely, as in most instances, farmers were loth to part with productive animals.

The returns from the creamerymen this year, as in previous years, have been made with much care. The money paid to patrons has in most cases been given exactly, and the number of cows has been arrived at by the collectors asking each patron the number from which they have furnished milk and cream. Some creameries have not been able to give the number of cows, and data from them has not been used. The amounts that have been paid by the different creameries, per cow, vary as much as they have in previous years and range from forty-two as the highest average, to as low as twenty-two dollars per cow. These figures indicate that the cows employed in creamery work, so far as covered by the reports, received between thirty and thirty-five dollars each, for the milk and cream sent to the creameries during the year.

More attention has been given cheese-making than in previous years. Most of the factories opened about June 1st, and closed about September 30. The patrons were paid for their milk in some cases, and in others, factories were operated on the co-operative plan. Most of the cheese has been sold for consumption near home, at prices that are very satisfactory to producers of summer milk.

Away from the great creameries, where the shipping of heavy cream to markets outside of the State is not practiced, summer cheese-making can well become prominent, and will yield more money than butter at usual summer prices. Our own State will take great quantities of soft, rich, mild-flavored cheese for home consumption, if it can only be had. The hard, dry cheese of Canadian and western manufacture, that is designed for export, is not popular on the tables of New England people.

Each year the sale of cream for consumption in our home markets, as well as outside of the State, is increasing. Over $300,000 were received by our creameries for this product alone. Although its price in the future may be reduced to a little nearer its butter value, the volume of the business will undoubtedly increase.

One of the most profitable features of our agriculture lies in the growing of milch cows for the Boston market. While there is no line of stock growing that pays the farmer better, and the production of large, deep-milking cows for sale is to be encouraged for the revenue it returns; yet, the retention of these animals on our farms would intensify our cow population and make easier the reforms in creamery methods, that we must adopt in the near future, if we keep our place in the onward march of the dairymen.

Much attention is being devoted to the production of succulent foods for dairy stock, and this class of foods is now regarded as indispensable to the profit and well-being of the milch cows. Beets, turnips, carrots and mangolds are grown to quite an extent, but the main reliance is upon some of the coarser growing varieties of silage corn, or the stalks and leaves from the sweet corn fields.

The methods of ensiloing crops are better understood, and the prejudice against milk and butter from silage-fed cows is disappearing. Succulent foods and comfortable barns make maximum yields in winter practicable; this, coupled with the higher prices prevailing at that season, renders it the most profitable period of the year. Never in the history of dairymen has there been so deep an interest manifested in every phase of the industry as prevails at the present time.

This is evidenced by the greater number of inquiries in the agricultural papers; the large amount of correspondence with the dairy department of the University; the close questioning of the institute workers; and last but by no means least, the broadening of the area of land under the plow, and the greater number of heifer calves retained upon the farms.

The Maine State Jersey Cattle Association, the only organization of Maine origin that ever fostered the breeding of pure-blooded cattle, has within the year redoubled its efforts to make known the productive value of the grand animals, whose breeding it has so long been jealously guarding. The State Dairymen's Association was formed a year ago and has entered upon its work. Every dairyman and creameryman in the State has a right to membership in it. It was organized for the purpose of forwarding our dairy interests. Under the direction of its officers and by vote of the Association, a Cream and Milk Testing Station has been established and is now in operation in Auburn. This furnishes an opportunity where the composite samples of every patron can be sent, and tested by expert workmen who stand between the sellers and the buyers.

The association needs the substantial support and counsel of every dairyman and creameryman in the State. The high price at which butter has been selling has induced the oleo fiend to show himself, and he has made his noisome presence felt in many sections. A *fraud* and a *counterfeit,*—no law that secures his abolition can be too severe.

The changes that take place in a single year—from meeting to meeting—are not so great as to enable one to present new truths and discoveries, or to avoid trespassing on statements previously made. Every year we learn something, by practical experience and contact, that is worth treasuring, and when it is applied to the business of our lives, it adds to our store of knowledge and aids us in becoming masters of our vocation.

For thirty years, American people have been studying butter-making as a leading line of work. We have in almost every neighborhood, specialists, who excel to the extent that they have become artists, and are producing from the plants that grow up out of the brown soil of these New England hills and valleys, the finest product that ever went from an American farm,—yellow, waxy butter. Had all the dairymen of our State attained the degree of perfect knowledge and practice that the few possess, the necessity for calling this *Conference* would not have existed.

The association and contact, secured by bringing men together who are engaged in the same industry, always elevate them if they can meet and accept in good temper the criticisms of their fellows.

To see ourselves as others see us, while not always pleasant, is frequently profitable, as it enables us to adapt ourselves and our business to the demands of an unyielding public.

When we first turned our attention to butter dairying as a leading industry, we were poorly equipped for the work. Our cows were mostly grades and natives. Dark, cold barns with flat floors were then their winter homes. The house cellars or the kitchen pantries were the dairy rooms. The shallow pan, dash churn and big bowls were the equipments. And this was only little more than thirty years ago. Yet, under these adverse conditions, there were dairymen and dairywomen who were artists.

Many of those farmhouses had granite walled cellars that were made snow white every spring with the germ destroying quicklime. If milk was spilled on the packed earthen floor it was at once scraped, wiped and sprinkled with lime. Milk-racks and all wooden utensils were scoured and scalded until the process finally wore down into the soft fibers of the wood and left the hard grains prominent. This was twenty years before the birth of the theory that bacteria were injurious to dairy products, but our mothers fought molds as they would a pestilence.

Under these conditions and with these appliances, with the cows on the green pastures of June and September, and in the open air night and day, butter was made that would rival the best of the exhibits in this hall to-day. But it was not always so; "dog days" did not forget to come, with their trails of slime, about the twentieth of July and reign for six weeks, with terror, while the pigs and calves grew fat and slick and laughed at the misfortunes of their owners. How to overcome these difficulties was the study of every dairyman. Some built cool air-ducts out of cement, out into the fields a hundred feet or so, burying them underground four feet or more, so that the air passing inward from the outer end, which was always lowest, would become cooled and temper the milk room properly. But our good neighbors, the Swedes, gave us the idea of the deep cans that they set in cool springs and we took them and put them in tanks of ice water and have snapped our fingers at "dog days" ever since.

The expert dairyman, with his herd of butter bred cows, with buildings and appliances sufficient for the purpose, is a factor of the utmost importance in solving the question of dairy education. Such a man will learn much from his reading and from contact with his fellows, because he is in condition to absorb every idea that is of value and to repel false theories. Although he may be master of his art, the education of such a man is never finished. The large number of these men who are engaged in private dairying, supplying customers in the villages and cities in our own State, as well as outside of it, constitutes an element in our dairying that is of the highest type.

Having secured their customers it is for their interest to hold them, and they study every detail, not only of the making of the butter, but of the making of the milk. Every factor that enters into the question of quality is as closely watched as are the conditions that affect the yield. They realize that quality only, will retain the market and they try to produce that quality. Although comparatively few poor butter-makers are engaged in this line of marketing, by no means are all of the good ones following it. Many private dairymen do not care to dispose of their products in this way, but prefer to wholesale, and consequently send to market to sell again. The volume of our private dairying is difficult to determine.

From the report of the State assessors we learn that we have 143,833 cows in the State, but this does not represent all of our milk stock for the reason that in these figures only creatures four years old and over are reckoned as cows. A large number of three-year-olds are in milk, but unfortunately the census returns include the males and females classed together to the number of 26,642. The number of oxen four years old and over is reported as 8,898. If the same relationship in numbers between the sexes that prevails with the oxen and cows, holds good with the three-year-olds, there should be nearly 25,000 females in this class, most of which, whether they be of the dairy or beef breeds, are in milk. In addition to this are the two-year-old heifers, which, when of the dairy breeds, are mostly in milk at from two to two and a half years of age. Counting these as only of value enough to bring the 25,000 three-year-olds up to average cow capacity, we have an equivalent of 168,000 cows.

The cow census returned to me by the creamery managers shows that we have about 30,000 cows that are employed in associated dairying; leaving 138,000 that are used as breeding animals in the beef herds; as dams and foster mothers of veal calves, and in private dairying.

The little county of Sagadahoc is engaged in extensive private dairying and has not a creamery within its limits. The great county of Aroostook with her 12,000 cows has but two small creameries, one of which is now closed. Scattered all over the State in outlying territory between creamery routes, and close up under the eaves of the best of our creameries, the private dairyman is doing his work.

I believe we have overlooked the private dairyman and his importance, and have not devoted that time to his welfare and upbuilding, that by right is justly his. Instruction upon private butter and cheese making wherever given at institutes has been received with evident satisfaction, and I doubt if the Board of Agriculture has a more prolific field in which to work than it may find in a neighborhood-to-neighborhood canvass, in summer time, with inexpensive but well equipped travelling dairies, spending two days in each place, using the milk at the farm where the stop is made, for butter and cheese making, and giving practical instruction to the dairymen and dairywomen who assemble there.

The creamery industry of the State is represented by the work of about 30,000 cows, and an income of nearly a million dollars from the sale of butter and cream. It has become the leading agricultural industry in those sections where it has been rightly conducted. Where the cow population is dense and good management has prevailed at both farm and creamery, the quality of the output has been good, and the returns to the farmer and creameryman satisfactory.

With good husbandry, the farms have grown better each year. Stimulated by the prosperity that came as the result of wise management and devotion to the details of a business that permits no neglect without protest, men in other sections adopted the plan, erected buildings, and engaged in the business where the conditions were not favorable to the undertaking. The cow population was scattered and in order to secure cream enough to do business with, the collectors' routes were extended out for miles through unproductive sections in the search for cream. The load at night was light and the expense of collection heavy. In order to economize, more infrequent trips were made over the same route so that a full load might be brought in.

When this stale stock has been manufactured into butter, the consumer does not eat it if he can find something better. Its selling price runs low, and the farmer receives much less for the product of his labor than he ought, and discouragement takes the place of the satisfaction that prevails when better and quicker methods are the rule.

The great curse to the creamery industry of Maine is the infrequency of the collection. We come together to devise ways and means for bettering the product, and discuss feeds, breeds, handling, manufacturing, ferments and bacteria, but we accept almost without question this evil that is many times greater than all others combined and allow its continuance and court the defeat that it surely brings.

Other dairy states used the same system that we are using, for a time, but found the same difficulty that we have found and they abandoned it for the separator system with its fresher cream. We have many sections, where with a dense cow population the centrally located creamery with its separators can operate to much the best advantage, but in the main our work is being done with scattered cows and the transportation of the whole milk would be a costly process. For the present, at least, we shall continue to do our butter dairying by the gravity separation of the cream, and by that process we can make as good an article as is yielded by any other method, but the conditions are exacting and must be conformed to.

I believe the time is not far distant when the small power or hand separators will be in common use in our dairies. The marked improvements in these machines during the past year, consisting in increased capacity and ease of operation, make them very desirable. They separate the cream in good condition and leave but a very slight trace as loss, while with gravity separation, even with the best of management the loss is several times greater. Should the hand separator be substituted for the Cooley cans, cleaner and fresher cream would be produced, but the necessity for frequent collections would be imperative then as now.

I wish to urge again as I have repeatedly done in the past, that the cream be collected in individual cans, so that it can be smelled or tasted by the butter-maker before he allows it to be poured into the vat with the bulk of the stock. With the cream of every patron separate, it is a simple matter to reject the small quantity that might leave a flavor that would ruin the whole mass. Once in, it can never be removed. One can of off-flavored stock may not absolutely ruin the whole mass, but it will depress the quality of the whole, to a lower level than the best. Again, the weights and samples taken by the creamery-man under favorable conditions at the creamery are likely to be far more reliable than the weights and samples of the collector who not infrequently is subjected to disagreeable storms and cold fingers, conditions under which no man can do good work.

I know of no method by which good, uniform butter can be so surely secured as by the pasteurization of the cream. For years we have been doing this at the Experiment Station and the more we practice it the more confident I am of the value of the process. I have studied closely the wastes in the buttermilk and found that the churnings are clean. If odors are present—from the condition of the cow, or undesirable foods,—they may be extracted by pasteurization. If any mixture has fallen into the milk and become absorbed there is no power known to the dairy-man by which he can extract it. In pasteurization sweet stock is absolutely essential and this will force the collection of the cream while it is still perfectly sweet. Pasteurized cream makes a dense, fine-grained butter which would be lacking in flavor if it were not imparted to it by artificial or home-made starters. If we can get every creameryman in Maine to adopt the system of collecting sweet cream, pasteurizing it and then using a starter which shall be from one common source, we shall be able to accomplish what we have been striving for so long, the making of an article which shall be uniform in every creamery in our State, and I do not know of any other way in which we can do it.

In the future, even more than in the past, we must depend upon the quality of our dairy products to retain for us our home market and that of the eastern cities. The whole country is enlisted in butter-making and competition is close. We can only retain the markets that are at our doors by making a product of high quality. We have the best of soil, climate, grasses, water and people. Let us put aside the one obstacle that stands in the way of our success.

THE CARE OF CREAM.

By E. L. BRADFORD, Auburn.

The care of cream must begin with care of the cow. The style of tie-up best adapted to cleanliness, health and comfort is a subject that well deserves all the attention it receives. Given a clean cow in a clean stable, the next requisite is a clean milker—in two senses of the term. Started right in these particulars it is well to think about the destination of our product.

In our large towns are many people of wealth and refinement, people whose delicate taste and fancy it is profitable to cater to, people who are able and willing to pay good prices for the product of skill and care. It is well to contemplate the highest standards of living and try to make our products suitable for a destination where such standards prevail. If we turn our thoughts in such directions a higher purpose than pecuniary gain will inspire to do our work in the best and most faithful manner.

Invalids use cream to a considerable extent. Doctors recommend pure cream for persons in feeble condition. It is our duty as producers and dealers to try to be worthy of the trust reposed in us. To sell milk from an animal known to be unhealthy would be acting the part of a knave and this article is not addressed to such. When to begin saving the milk of a fresh cow, and when to dry off a cow or to reject the milk of a cow that will not dry off are questions for the good sense of the dairyman. I believe the milk of strippers is sometimes used when it ought to be thrown away. Such milk, by its thick, sticky nature may prevent a good separation of the cream and cause a loss of fat in the skim-milk. I have a notion that this may explain some cases of falling tests where "the cows are the same, the feed the same and the milk is drawn the same."

Let us now follow the milk to the creamer or separator room, which should be well outside of the lean-to. Here we hope to find everything clean. If, however, just when we are making this visit, the water in the tank should be a little milky, smell rather bad, or if the skim-milk tub, or the spout should show neglect, there will of course be some reason given for it. "I was intending to have fixed this several days ago, but such and such happened." The man is, in short, making excuses. He knows these things are not right and for the time being, at least, he is ashamed of it. I have heard that things like this happen sometimes in butter factories. But supposing nothing has occurred to interfere with the proper discharge of duty we shall find that the water in the tank is pure; the walls, floor, bench, cans and all connected with the milk room are clean. All cans, pails, etc., that the milk comes in contact with must not only look clean, but they must be thoroughly scalded with a liberal quantity of boiling hot water. In the case of Cooley cans a little of the hot water must be let through each faucet. I wish to emphasize the importance of carefully washing and scalding the cans every time they are emptied. I am afraid this most necessary work is too often neglected.

If the milk or cream is to be preserved for use or if it is to be sent away to the factory to be made into butter, it must be kept as cold as possible without freezing. The butter-maker wants the cream to come to him in this way and he will manage the tempering and ripening. Do not be stingy of ice in hot weather. It is not very expensive stuff and it should be used freely in order to properly preserve the cream. I do not claim (what I have often heard people say) that it takes less ice to run a creamer very cold than it does to let it warm up. Neither do I think that the cream rises any more perfectly—though perhaps it rises quicker—in a very low temperature. But I do know that where cream is to be shipped away to market it is necessary to keep it at the lowest temperature possible without freezing. A mistake is sometimes made in setting the cream out of the tank—handy for the collector. Exposure of this sort for an hour or more in hot weather is injurious.

Cream is wanted at the factory and in the market as fresh or new as possible. So the proper condition of cream for delivery is described with three words—*pure, fresh, cold.* It is necessary to have the cream in good condition in order to get and preserve a correct sample of it for testing. A patron's test dropped extremely low in a cold winter month. Investigation showed that his tank was not full of water. The cream above the water line (the richest part of it) partially froze and did not enter the tube when the sample was taken. If any one should ask the question whether it hurts cream to freeze it, I should reply that it just about spoils thick cream for use as cream. The damage to thin cream is not so apparent, but it is less trouble and expense to keep it from freezing than it is to thaw it out.

According to my observation a felt blanket is the most practical thing for the cream gatherer to use to protect the cream from heat or cold. Where the load of cream has to be out in the heat of the day for a number of hours the cans must be closely packed in the wagon and lumps of ice put on top of the cans. Ice lying on the bottom of the wagon produces very little effect. Cream thoroughly iced and blanketed, whether on a wagon or in a car, can take no possible injury from transportation in the hottest day. Arrived at the factory, cream for churning is tempered and ripened as soon as can be done conveniently. The churning temperature varies with the richness of the cream and the season of the year. Rich cream churns at a lower temperature than thin cream. Cream intended for retail trade is generally made to test from 42% to 45%. I have tested several samples from other states and have found this to be the range for leading brands. Such cream is largely obtained in this State by running fresh, thin cream through separators. It is probably all pasteurized. This thick cream is obstinate stuff to cool to a low temperature by a rapid, continuous process, the way we would like to handle it. It is a poor conductor of heat and does not flow freely like milk or thin cream. The part that comes to the cooling surface thickens, sticks there, and does not give the rest any show, so to speak. We finish up the cooling of our thick cream by setting in tall, slim cans in ice water. This applies to 45% cream to be cooled to a low temperature. Cream of a lower test is readily cooled enough for churning as fast as it flows from the separator. We are pasteurizing now all the thin cream we send to market. I think it prevents the bitter taste that sometimes develops in raw cream, especially in fall or winter.

The pasteurizing of all cream for butter-making may soon become a general practice of the creameries. The plan may easily be adopted by any creamery and is worthy of investigation by every creameryman.

Hon. H. C. ADAMS.

I am surprised at the largeness of this meeting. I wish to congratulate the Board of Agriculture of the State of Maine upon the fact that it holds its annual dairy conference in so nice and thriving a city as this of Lewiston, where you have so good a hotel, where the people are so cordial, and where you have such a splendid hall for your exhibit and your meeting. I came from a dairy state. I have been interested in looking over this old, historic State of Maine, which has given so many strong men to help run this national government of ours, and which has a population of such intelligence and such industry. With natural conditions perhaps not quite as favorable as in some of our western states, you have built up a strong and a prosperous commonwealth. It has been a matter of great interest to me, coming from the prairies and the forests of my own state of Wisconsin, to pass through New England and see your cities and your villages so clean, your farmers so well dressed; and upon some of the stony hillsides of New Hampshire, where it seemed as if there was hardly room enough to pile up the stones in fences, to see clean farms and neat buildings, indications of that American spirit of industry, thrift and good sense which is characteristic of the best portion of our people. Now out in the West we are inclined to brag some, when we are at home we do it a good deal. Some of us do it when we are away from home. I do not want to do it too much, although I am proud of my own state, but I want to say to you that in Wisconsin, with all our splendid soil, with all our splendid forests, with all our people of many nationalities, we do not have anything better than the people that come from New England. We do not have anything better than that strong, old Puritan morality which lies at the base of the best things in every state in this Union. We do not have anything better than that economy which looks after little things and wastes nothing. We have great wealth and resources but the crime of the western farmer is wastefulness. And so, while there may be some things that we can tell you, that you do not know as well as we do, there are a great many things that you can tell us, about sound business, careful methods of running a farm, that would be of great value to the Wisconsin farmer.

We have men in Wisconsin, you may have some in Maine, who will run a herd of dairy cows for ten years when not one cow in three pays her way. I have been in the dairy business, and I have worked at some of the hard problems of that business in my daily life. I tell you the Maine farmer of to-day and the Wisconsin farmer of to-day have advantages that they ought to be glad to have and make the most of. When I started in the dairy business, in 1878, when I had just been married and had one cow and one horse, if I could have had the advantage of the experience which Mr. Ellis has had, worked out during long years of hard work and careful thought, if I could have started with that knowledge, it would have saved many years of hard labor. This whole business of dairy education is of great value to those men who will think. The trouble is there are a great many men who will not think. We have farmers' institutes, and they do any amount of good, but the trouble is that the men whom we want most in those institutes we cannot always get. We are getting some of them, more and more each year. They are beginning to realize that this business of farming is a business that must be studied. The old notion was, twenty-five or thirty or forty years ago, that any fool could be a farmer. Well, any fool can be a lawyer, and a great many fools have reached out in that direction, but no fool can be a good farmer, and no fool can be a good lawyer. A farmer has a pretty big problem before him in working comfort and money out of the soil. It is all very nice to have some polished orator come before you, who may be a lawyer, or may be engaged in some other line of business, and tell you that you are following the noblest vocation on earth. He does not follow it, but he wants to satisfy you that this business of farming is the noblest business on earth; while I say to you that it is not any better than any other honest business, but it is just as good. The farmer has to deal with the soil, with the atmosphere, with animal life. He has to touch the science of chemistry, he has to touch the science of botany, and of natural history. Whether he knows it or not, he is dealing with all these things, and I tell you that an American farmer, who knows his business down to the ground and understands these different sciences is a broad and a splendid man. The business of farming is a good business if you make it a good business. The American farmer will succeed when he becomes thoroughly a business man. The American farmer will succeed when he keeps his mind open to the new ideas and the new things that are coming into his business. The mayor of this city said that this is an age of progress. It is an age of progress, we are jumping along all the time. We must keep in line with the procession, which goes on. We ought never to sit down in a rut and stay there because our good father—bless him for his efforts and his wisdom and his industry and his love—was in it. Undoubtedly he did very much better than his father, and you are not as good a man as your father unless you do better than he did. President Adams of the State University of Wisconsin, who came from New England to teach us wisdom, never said a truer thing than when he said to the Wisconsin farmers in the State University, "Boys, you should stand on the shoulders of your fathers." It is no discredit to our fathers if we ignore some of the ways which they thought were profitable.

The modern dairyman who would go on, must have a good machine to do business with; that machine is the cow. His first business, if he has not done it before, is to go just as quick as the Lord will let him and test every cow in his herd. I promise you he will have some of the biggest surprises in his life. He will find out that some of the cows that he thought were of the greatest value are of the least value. You cannot afford to fool away your time chasing around after a poor cow. This cow business is a pretty steady business, and if a man succeeds in it he has to follow the cow and be her slave to a greater or less extent, and he wants to follow a cow that is worth following. At the Experiment Station they took three cows and fed them upon the same ration, and one cow made eleven ounces of butter a day, another one and one-fourth pounds a day, and another cow very nearly two pounds of butter a day. One cow made just about enough to pay expenses, another paid a reasonable profit, and the other paid a good profit. And it cost exactly the same amount of money to feed and keep all of those cows.

I have not time this morning to go into details, although details are the things that are of value in a dairy convention. I am trying to touch this subject lightly, but I want to say to you, do not ever undertake to get a dairy cow out of a cow that is masquerading in the shape of a steer. You will never make a success of it.

Your dairy cow should be small in front and large behind. The front end of the cow is not the business end. She should have good, large nostrils, so she can get a lot of air into her lungs. She should be thin through the shoulders and have a thin neck; she should be broad between the eyes. I never saw a cow in my life that was worth the powder to blow her up, that was narrow between the eyes and had a small nose. She should have a good backbone. A dairy cow that is producing 300 pounds of butter a year does an enormous amount of business. In order to do that business she must consume an enormous amount of food, and in order to consume that food she must have a good place to put it. That cow must be broad across the hips, she must have good milk veins, she ought to have a thin, soft, pliable skin. You will never find a cow that will have all these points in perfection, but you can find cows that will come pretty close to it. I saw one yesterday in the vicinity of this city that is very nearly a typical cow. Go and find a cow that is a type, and get one as near like her as you can, and then you will do business and be satisfied, because you will make money.

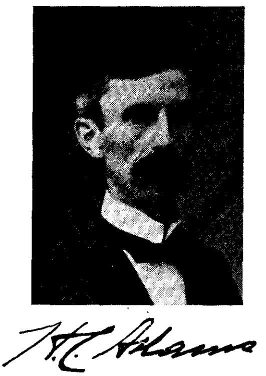
There are several ways to handle the dairy product. One is to put it up in a slipshod way and put it into any kind of a package, and then you will get beaten. A man married a young lady who had the reputation of being a first-class butter maker. He made a shipment of his wife's butter to Chicago and got six cents under the market price. He was very indignant, as a man when first married has a profound respect for his wife, and he sent a letter to the commission man and said: "My Dear Sir—I received six cents per pound less than I ought to have. I want you to explain it." The commission man said: "My Dear Sir—When you make the kind of butter that is wanted in this market we will give you the highest price for it." The young man wrote to the commission man and asked him to send him a sample of the kind of butter that brought the highest price in the Chicago market. The man sent him a sample and he worked at that business until he made some just like it and sent it in and obtained the highest price. And he has done that ever since. It does not make any difference what you and I like in butter, the question is, What does the market demand?

You can do two things in this dairy business,—make butter on your own farm, or send the milk or cream to some creamery. It will pay a man to make butter on his own farm who has a pretty good sized herd of cows, who likes the business, and who knows how to make butter. But a large proportion of the farmers of my State are not fitted for the business, and they do a sensible thing; they say, I am not a very good butter maker, but I can feed cows and take care of them and I am going to put my milk into the hands of a man who makes it the business of his life to make butter. And the consequence is, we have 1,000 creameries and 1,700 cheese factories, and make eleven million dollars worth of butter every year and seven million dollars worth of cheese, and sell enough milk, and have enough skimmed-milk, to make a total product of thirty million dollars a year; and that business has brought great wealth and great comfort to our Commonwealth. And so when the farmers go to our State legislature and ask for an appropriation to spread this dairy knowledge which is of practical value to the farming interests of the State, the legislature gives it whether it wants to or not, because it is compelled to give it by the overwhelming sentiment in behalf of an industry which adds to the wealth and to the comfort of so many.

I want to congratulate you upon this meeting. I have been in a great many meetings of this kind, in my own State and in other states, and that meeting is always the best where every man in it feels at liberty to get up and ask questions. Every man ought to feel that it is a part of his business to make it a good meeting. I like to see a meeting get so hot that men forget themselves and talk anyway. I have seen farmers in my State that you could not hire to talk by sitting down and reasoning with them, but if some man would say something that they did not believe they would jump up and talk, forgetting all about it. We come into these meetings to make them a pool of knowledge. Every man can put in something. Every single man has that in him which is superior in some way to every other man, and so in these meetings bring in what knowledge, and information, and inspiration you have and put it into this common pool of knowledge. And each one of us can take that whole wealth home with him and nobody will be poorer but everybody will be richer.

THE NECESSITY OF PURE FOOD LEGISLATION.

By H. C. ADAMS, Madison, Wis., Dairy and Food Commissioner of Wisconsin.



Pure food legislation means laws to prevent the adulteration of food, to protect the public health, to protect consumers of food products from fraudulent impositions and producers of these products from fraudulent competition.

Men cannot be made honest by law, but law can make dishonesty pay a penalty when it steals the livery of honest products to serve a dishonest purpose. In every civilized land and in a few where civilization is not as radiant as in our own, fierce competition and unbridled greed have undertaken to profit by the adulteration of nearly every article of food used by the human family. As in every other department of human effort, there has been wonderful progress during the last half century. The clumsy wooden nutmeg of Connecticut, that even a policeman might detect, has given way to artificial eggs which no hen would recognize, and to artificial butter that never knew milk. The universal demand for cheap things brings a supply. Wheat flour is adulterated with corn flour; buckwheat with wheat middlings. Vermont maple syrup is made from the sap of trees that grow in the heart of Chicago. Glucose has dethroned cane syrup. Cider vinegar is distilled from grain. A good portion of the strained honey of commerce never produced any strain upon the bees. Milk is robbed of its cream, filled with lard and sent all over the world to ruin the reputation of American cheese. Borax and formaldehyde go into milk to kill babies and weaken invalids. Oysters are partially embalmed with chemicals. Lemon extracts are made without lemon oil, and vanilla extracts without vanilla. The hogs of the north compete with the cheap cottonseed oil of the south and mix in the same tub under the banner of lard. Artificial smoke is made for hams out of poisonous drugs. Jellies colored in imitation of the natural fruits and sold as fruit jellies flood the markets, although they are almost as destitute of fruit juice as a bar of pig iron. The embalmed beef business has been exaggerated, but we do not need any for either soldiers or civilians. Canned fruit is preserved with antiseptics which delay the digestive processes. Baking powders under misleading names crowd the markets. Spices enriched with pepper hulls and ground cocoanut shells are manufactured and sold by the ton. The close partnership which has existed for so many years between coffee and chicory does a thriving business in many states under the firm name of coffee. Cheapness is secured by these adulterations and false labeling, but the people are defrauded.

In round numbers there are 15,000,000 families in the United States. The annual grocery bill of each family is at least $130. This would make the total annual expenditure of the people of this country for food products, exclusive of meats, $1,950,000,000. The August issue of the British Food Journal contains an article upon Statistics of Food Adulteration by Cecil H. Cribb, B. S. F. I. C., in which authorities are quoted showing that the United Kingdom consumes annually $800,000,000 worth of food products, exclusive of meat and sugar. The population of the United States is nearly double that of Great Britain and Ireland and the fact is recognized by all statisticians that our people pay more per capita for food than those of any other nation. The estimate made of the value of food products consumed here is certainly less than the correct amount. If the value of the food annually consumed approaches $2,000,000,000 in amount, the people of this country spend at least $300,000,000 for food products that are mixed with cheap or injurious adulterants or sold under misleading names.

The food question is a serious one. It is important to every man, woman and child in the land. It concerns the public health. It touches the public pocket. Pure food laws are designed for the protection of the public health and the public pocket. Their necessity has been recognized by every European government, with England leading in 1875. Every American state has pure food laws except Wyoming and Arizona. These laws are not class legislation, as their enemies contend. They are primarily for the benefit of consumers, who include all classes. Incidentally they help the producers of honest articles of food. Beyond question, they are oppressive to men who try to get something for nothing and whose love for a dollar is greater than their regard for the public health. It is not a fiction that unhealthy adulterants are used in many food products. Under the labels of "Freezine," "Preservaline," "Liquid Sweet," "Liquid Smoke," "Rosaline" and other fanciful names, they are manufactured by hundreds of tons, placed in every market in the United States, shipped to foreign countries in immense quantities, and advertised with a skill and effectiveness that compels public attention. One firm in New York, with a branch in Chicago, sent to Australia during the last year one hundred and fifty tons of preservaline, a large portion of which was used in the butter which that country shipped to England. These mixtures are antiseptics and contain boracic acid, formaldehyde and sulphite of soda. They are used to preserve milk, cream, butter, oysters, fish, canned goods and meat. They are of a poisonous character, and their introduction into a food delays or stops the digestive process. France prohibits the use of these preservatives in all domestic wines, except those exported. Germany has the same regulation in the manufacture of beer. England prohibits the use of deleterious antiseptics. In 1895 the French government submitted to the Academy of Medicine an inquiry about the use of salicylic acid in food. A thorough investigation was made and a report submitted which concluded as follows:

1. "It is estimated by medical observation that small doses of salicylic acid repeated daily for long periods of time are able to cause notable disturbances of health, in the case of certain impressionable persons, and in the case of those whose kidneys or digestive tract are not in perfect order.

2. Therefore, the addition of salicylic acid or its derivatives, even in the most minute amounts, to foods, solids or liquids, should not be authorized."

Dr. H. W. Wiley, chemist of the department of agriculture at Washington, condemns the use of preservatives in food. Every aggressive dairy commissioner in the United States occupies the same position. Dr. A. B. Prescott and Prof. O. C. Vaughn, Director of the laboratory of hygiene, University of Michigan, testified before Senator Mason's committee in Chicago that preservatives containing boracic acid and formaldehyde were distinctly dangerous to the public health when used in food products. Dr. Morrison, health commissioner of Indianapolis, recently made ninety tests of the effect of preservatives upon the digestive process. He found that they interfered seriously with animal digestion, and that when introduced into an artificial digestive ferment, they retarded the process of digestion from one to two hours.

Healthy people can stand considerable poison and survive the consumption of indigestible food, but babies and invalids, of which we have several millions in this country, who are quite dear to us, should be protected by stringent laws from the dangerous greed of men who are willing to trifle with human life in order to make money. Recently, in a Wisconsin city, an infant was treated for six weeks by a skilled physician, who was puzzled by an obscure malady. Finally he caused a test to be made of the cow's milk used by the child. It was found to contain boracic acid. The milk was changed and the child recovered, although it had been at the point of death.

Dr. S. M. Babcock of Wisconsin University, the famous originator of the Babcock test for milk, and whose reputation as a chemist reaches beyond the limits of the United States, is unqualified in his condemnation of the food preservatives upon the market. Gov. W. D. Hoard, who for years has occupied the highest place among the dairy authorities of the world, has vigorously and effectively defended the laws which prohibit their use. They are not necessary in clean, honest business, and no other kind of business is entitled to the protection of law. Preservatives put a premium upon uncleanliness and carelessness. There is serious need of legislation to prohibit their use. They are prohibited by specific acts in Wisconsin, Connecticut, Ohio, Massachusetts and New York.

The force which has been behind most of the pure food legislation of the United States for the last fifteen years has been the farmer. The dairy commissions of the several states have been brought into life because the farmers demanded not only laws, but the machinery to enforce them. When the American farmer is roused he keeps everybody busy. He may be childish sometimes, but nobody accuses him of being weak when he stirs his class to action in a movement that is right. The American farmer can get along without flattery. He ought not to get along without justice. He sometimes nods and sleeps over public questions, but when he goes at it in earnest to take a hand in their settlement political rings are broken, unwise political bosses go up in the air, golden collars become a rope of sand, and popular judgment is crystallized into law. Farmers in different sections of the country may have temporary aberration of mind and take up fads exploited by agricultural demagogues that are prejudicial to the public good. They may sometimes be led into unreasoning denunciation of wealth, of political parties, of courts and of other classes, but the great bulk of farm judgment to-day is stronger and better than it ever was, because it is more intelligent. It can be relied upon if it can be secured. The farmers besieged congress and fairly compelled that body to pass the oleomargarine law of 1886. It was charged then, as it is now, that that act was class legislation. It was an act to prevent the destruction of the great butter industry of this country by a business which depends for its success upon deceiving the public. If that act had been class legislation, would not the oleomargarine interest which was aggrieved by it have used the money, of which it had an ample supply, to secure legal talent which would have compelled a favorable decision from the courts?

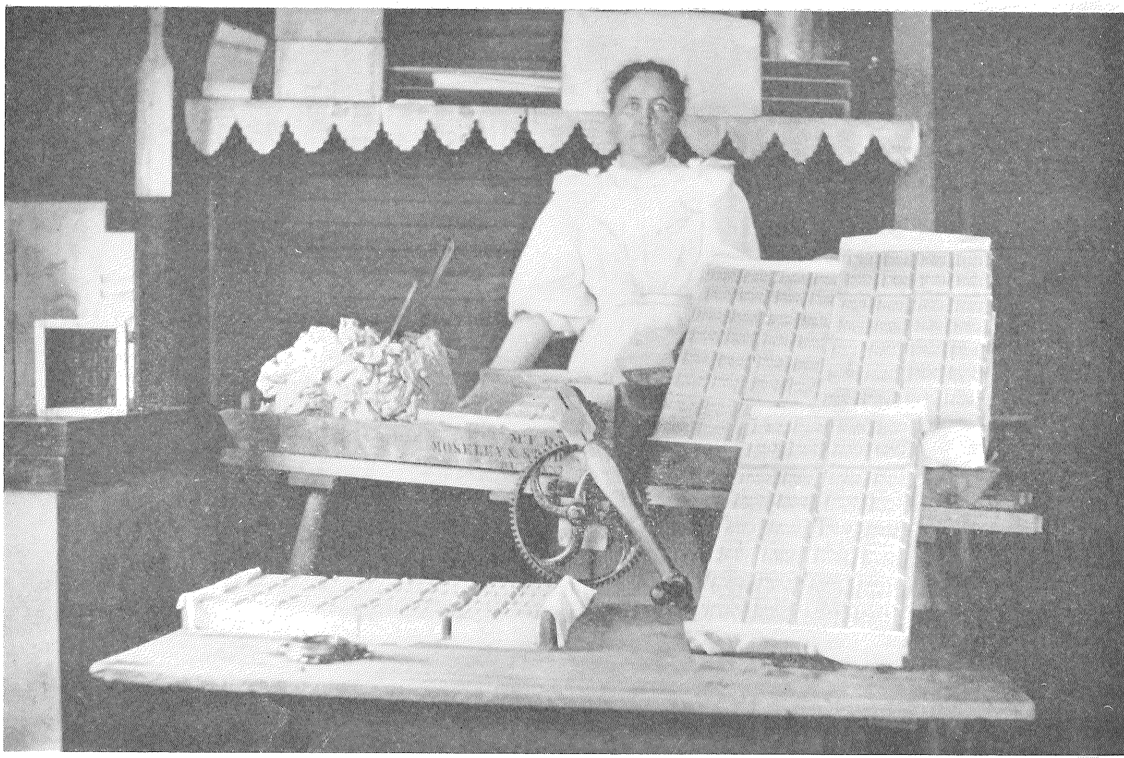
Oleomargarine laws have been upheld by the courts, not because they help farmers, but because they prohibit the delivery to a man who buys and pays for butter of something which is not butter. The dairy industry of the United States is of sufficient importance to be gracefully accorded any benefits which may come from the prohibition or limitation of a fraud in trade.

The butter product of this country has an estimated annual value of $300,000,000. All of the silver and gold products of the country for two years could be bought with the product of the churn for a single year. Not only that, but the cow leaves behind her farms which are richer in fertility, and farmers richer in the knowledge which the mysteries of her life and product compel. The dairy business of this country has renovated hundreds of thousands of farms and hundreds of thousands of farmers. It is the enemy of farm mortgages, the friend of the merchant, the manufacturer, and men of all classes, except those who imitate the product and claim a God-given right to copy the form of that product and steal its color. Only the limitations of state and federal constitutions should restrict the laws that hamper the traffic in counterfeit butter.

Oleomargarine has its rights. It has a right to be composed of lard, beef fat and cottonseed oil. It has a right to be sold under its own name and color, if not injurious to the public health. It has a right to be manufactured at a cost of eight cents per pound and retailed for twenty cents per pound, but it has no right to crawl into markets in the clothing of a more costly product. The law of 1885 taxed oleomargarine two cents per pound. It should have been taxed ten cents per pound. The small tax was accepted because the act provided for the branding of packages, and thus guaranteed to first purchasers a knowledge of what they bought. No matter what is claimed by the friends or enemies of the oleomargarine interest, this tax has greatly restricted the oleomargarine output. Eighty-seven million pounds were manufactured last year. Untrammeled by federal law, the product would have been five times that amount. But the law has been ineffective in this: the patron of the restaurants, boarding-houses and hotels where oleomargarine is used cannot be informed as to what he is getting by labels upon original packages. He calls for butter and gets a cheap counterfeit. The simple fact is that the great bulk of the oleomargarine product is eaten as and for butter.

It is said that good oleomargarine is better than poor butter. This is not disputed. But poor butter does not fool anybody. It may be poor and not very respectable, but it is honest. It advertises its own deplorable condition. It may look well, but even to the delicate senses of an oleomargarine advocate its divorcement from the breath of new-mown hay and the scent of clover blossoms is most complete.

It is charged that the farmers of the country are leagued together to prevent poor men from getting cheap substitutes for butter. Poor men do not charge this, but the impassioned lawyers of the oleomargarine manufacturers do in their appeals to state and national legislatures. Farmers have not been very



SECTIONS OF DAIRY ROOM OF L. W. DYER, ALLEN DAIRY FARM, CUMBERLAND CENTER.
Machinery run by tread power, outside the room.

conspicuous in schemes to injure poor men. Most of them at one time or another have occupied positions in that class. Many of the gentlemen who run counterfeit butter factories are undoubtedly charitable and take genuine pleasure in relieving human want. Their distress about the impoverishment of the laboring classes through the purchase of genuine butter may be sincere. Two things they may not know. One is that the man who eats oleomargarine pays nearly or quite a butter price for it, and the other is that a poor man, above all others, having but little and buying but little, wants that little good.

An effort has been made to array the dairymen of the country in opposition to the stockmen upon this question. In this all questions of public policy are left out and only class interests considered. Accepting this basis of argument, of what avail will it be to the stockmen to have oleomargarine sold unrestricted, dairymen driven out of business by tens of thousands, and these thousands of energetic men with their millions of capital employed in the stock business, increasing the supply of cattle, hogs and sheep and thereby diminishing the price? Whatever strikes an unwarranted blow at one legitimate farm interest hurts all. Farmers should stand together in defense of oleomargarine legislation, first, because they should be good citizens and loyal supporters of laws to prevent dishonesty in trade; and, second, because the oleomargarine industry as conducted is a serious menace to the agricultural interest. The necessity of pure food legislation, as applied to oleomargarine, is recognized by thirty-two states which have prohibited the manufacture and sale of that article when colored in imitation of yellow butter. Massachusetts has furnished the model for these laws. The supreme court of the United States has declared them to be constitutional. In that decision the following opinion is rendered:

"We are of the opinion that it is within the power of a state to exclude from its markets any compound manufactured in another state, which has been artificially colored or adulterated so as to cause it to look like an article of food in general use, and the sale of which may, by reason of such coloration or adulteration, cheat the general public into purchasing that which they may not intend to buy. The constitution of the United States does not secure to anyone the privilege of defrauding the public. The deception against which the statute of Massachusetts is aimed is an offense against society; and the states are as competent to protect their people against such offenses or wrongs as they are to protect them against the crimes or wrongs of more serious character. And this protection may be given without violating any right secured by the national constitution, and without infringing the authority of the general government. A state enactment forbidding the sale of deceitful imitations of articles of food in general use among the people does not abridge any privilege secured to citizens of the United States, nor, in any sense, interfere with the freedom of commerce among the several states."

This judgment seems to be unassailable. It includes Judge Harlan's famous statement that the constitution of the United States does not secure to anyone the privilege of defrauding the public. Every defender of organized iniquity, when hurt by state legislation, gets noisy about the rights guaranteed him by the national constitution. When afflicted by federal law he becomes a violent advocate of the state rights guaranteed by that same constitution. Judge Harlan, in one sentence, clears an atmosphere befogged with sophistry, with special pleading, with glib talk masquerading in the forms of constitutional argument and the bitter wailings of men claiming in fact that one of the inalienable rights of an American citizen is the right to defraud another American citizen.

Pennsylvania prohibited without qualification, the manufacture and sale of oleomargarine. New Hampshire required that it be colored pink. The supreme court of the United States declared both laws unconstitutional. The decision was well grounded if the question of wholesomeness was not entertained. If the use of oleomargarine is not inimical to the public health, its sale should not be restricted in the markets, if sold under its own name and color, any more than the sale of jack-knives or Derby hats. Oleomargarine legislation must be upon reasonable lines. Unfair laws to protect farm interests are worse than no laws. They alienate men who think, and the farmers will never be so strong that they can afford to antagonize sound public judgment.

The wholesomeness of oleomargarine is a disputed question. In foreign hospitals its use is prohibited. Hygienic authorities declare it to be less digestible than butter. Samples have been analyzed by the chemist of the agricultural department of New York which contained from five to twelve per cent of paraffine. This is considered an absolutely indigestible substance. The patents obtained for oleomargarine compounds show them to contain poisonous chemicals. However, it is possible to make oleomargarine which is simply less digestible than butter because it is composed of animal fats melting at a higher temperature than butter and having an inferior flavor. Prosecutions can be had under the general pure food laws of the states if oleomargarine is so made that it is regarded as unwholesome.

Pure food legislation has greatly restricted the manufacture and sale of that abomination of the markets known as filled cheese. Skim-milk and lard form the bulk of this compound. It has inferior flavor and poor keeping qualities. Its manufacture and exportation nearly ruined our foreign cheese trade. In 1892 there were nearly two hundred factories making it in Wisconsin. The legislature of 1895 prohibited its manufacture and sale. There is not a factory of this class in Wisconsin to-day and there has not been for two years. The makers of honest cheese in our state, relieved from the competition of fraud, recovered their courage and are recovering their domestic trade. It takes time to restore our reputation abroad. Canada clubbed filled cheese out of her borders earlier than we and usurped our place in European markets. She is improving and developing her cheese industry with marvelous rapidity. The Canadian government inspects her factories and takes up questions of cheap and safe transportation. Her people are not afflicted with a fear of the ghosts of paternalism. They believe it to be a province of government to develop the material resources of a country, even through benefits to a particular class of people and through the medium of administrative acts that might cause haggling in supreme courts. The act of congress which placed an internal revenue tax upon filled cheese of one-half of a cent per pound, has been of great value to our cheese industry. Its purpose is partly defeated in shipments abroad, because stamps are removed. But it was notice to the world that this government wants its food products sold upon their merits and under their own names. It has placed a burden upon the filled cheese industry that has driven a majority of factories out of the business.

Pure food legislation should be both state and national. State legislation has been generally sustained by the courts and has been effective. We need a comprehensive national pure food law. The senate of the United States has recognized this necessity and appointed a special committee of investigation, of which Senator Wm. E. Mason of Illinois is chairman. This committee has held a number of sessions in Chicago and is collecting a mass of valuable testimony. The result of the work of this committee will undoubtedly be the introduction into congress of a bill to prevent food adulteration. It will be argued, as it always has been when this subject has engaged the attention of congress, that the federal government has no authority to regulate the traffic in food products; that the states alone can exercise police powers; that when congress has interfered to require that counterfeit food products should be labeled, it has done so through an exercise of its taxing powers, and that only in this way can its authority be exercised. If this proposition is correct, a national pure food law would be worthless. Is it correct? The constitution gives congress the power to regulate commerce between the states. It reserves to the states, in the 9th constitutional amendment, all powers not granted to the general government. But the power to regulate interstate commerce has been explicitly granted to congress. It is exercised over railroads and in quarantine regulations. No other authority can exercise that power completely. Its power over articles of interstate commerce is as clearly granted as over the postal service, which it controls without question. It exercises police power by prohibiting the transmission through the mails of mail matter designed to corrupt or defraud the public. Has it not an equal right under the constitution to prohibit the transportation from one state to another of articles injurious to the public health, and determine what shall be required of manufacturers and dealers who send food products from state to state that are redolent with fraud?

A national pure food law would supplement the state laws and give the food products of this country better standing in foreign markets. It would aid the states, which have, by stringent laws, stopped the manufacture of adulterants by stopping the flood of counterfeit foods that pours into their markets from other states. It may be urged that such a law would make superfluous the dairy and food commissions of the states. If this should prove true, it would conclusively demonstrate the merits of the law. The dairy and food commissions have been organized, not to create offices, but to stop deception and fraud. When deception and fraud in the manufacture and sale of food products shall have been stopped, we can afford to pronounce a benediction upon the dairy and food commissions and rejoice in the reign of honesty in trade. But a federal law, valuable as it would be, leaves a broad field for state legislation. The domestic trade in food products of the several states is enormous. As long as many men are smart and some men dishonest, the food of the people will be mixed, colored, coated, polished and poisoned, and watchful state care will be needed to limit the evil.

This question of the character of the food supply of 75,000,000 of people is not one to be settled by doctrinaires or hair-splitting constitutional lawyers. It will not be settled by all the money and all the brains that are at the command of the manufacturers of counterfeit products. It will not be settled by ridicule, abuse or misrepresentation of the men who till the farms of the nation and produce most of its food. It will not be settled by court decisions that in effect deny the statement of Judge Harlan, that the constitution of the United States guarantees to no man the right to perpetrate a fraud. It will not be settled by the pleading of any class for the privilege of plundering somebody. It will not be settled by chemists and experts hired to give opinions. It will not be settled by legislators who do not care for the public good and who do not fear public judgment. It will be settled, as it is being settled, by the voice of the consumers of food products, demanding laws which compel these products, if sold, to be honest and healthful, and by the American farmer claiming the right of way for the honest products of honest labor.

JOHN J. FRYE.

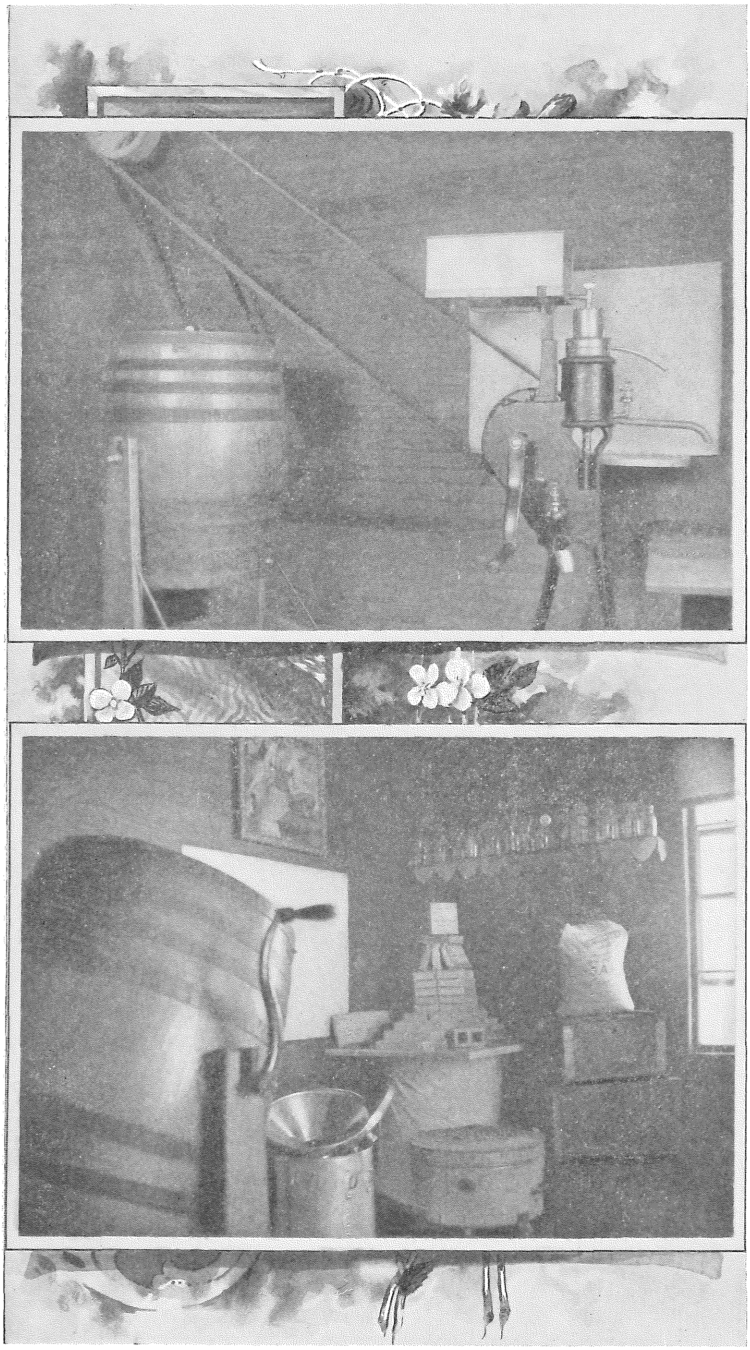
I think the subject to which we have been listening this afternoon is of great importance. When we think of the articles brought into the country as food for man and consider the adulterations, we realize the importance of the matter. The mayor of our city of Portland said to me a few days ago, "There must be something done in this milk question. Our children are dying from adulteration of milk." I am glad that American citizens are being awakened to this question, and that they will soon rise and say, "We will have no more of this adulteration, unless it is put under its proper name." Our speaker has referred to the commission that they have in the West, a glorious thing, but what is law without something to enforce it? If we have this commission, let us have a man that shall go about and see that the law is enforced. Ladies and gentlemen, let us hold up our hands for a better day, when these things shall be done away, and the rights of mankind shall be maintained.

PROF. CHAS. D. WOODS.

Not quite a year ago, in Representatives' Hall, Augusta, at a meeting of the State Board of Agriculture, I had the pleasure of talking upon this same subject, and you will find some very valuable hints in the report of the Board of Agriculture. There is a matter that we have got to look squarely in the face, and we must meet it as intelligent men and women, and that is this fact of the adulteration in foods. Foods are going to be adulterated always, in my opinion, but there is one thing that we can stand for, and that is, correct labeling. Just so long as when I go out on the street and go into a grocery store and ask for fruit jelly, they give me starch paste colored with an aniline dye, flavored with a coal tar derivative and sweetened with glucose, just so long I am getting deceived. When I go into a store and buy a can of corn I have a right to know if sugar is added to it. It does not harm it, but I have a right to know if I am getting cane sugar or glucose, if I am suffering from diabetes. I furthermore have a right to know whether the man who made it has put in any salicylic acid to preserve it, in order to save expense. If salicylic acid were as harmless as water, I have the right to know whether it is being administered to my person. It makes but little difference whether a thing is proven harmless or not. It may be that every man in this house can eat salicylic acid and not be harmed, but it does not prove that I can do it. If you want to buy chicory for your coffee, it is all right; the whole French nation prefers it, but in France it is labeled correctly. If I go to a store and ask for anything, no matter what it is, I have the right to get what I am asking for. If I want to buy a spice at a low price it is all right for me to do it, but I should know whether it is made up of the P. D. mixtures which are sold at a few cents a pound and manufactured over into these various spices. And it seems to me that this is where we must stand on this matter. We have got to look it squarely in the face, and it must come largely from the farmers. With the exception of the oleo law, and one or two other laws, we have not a single efficient food law in the State of Maine, regulating the purity of foods. We have a law against the adulteration of alcoholic beverages, but we have not an efficient law against the adulteration of food materials. Let us try to get one.

Hon. H. C. Adams.

I have talked on this subject of pure foods a great deal, and occasionally some sarcastic individual has inquired why I did not try some of this pure food myself. I have replied to that by quoting an old and rather ghastly Chinese proverb to the effect that he who puts on flesh lays up food for worms. I agree with my friend, the professor, to an extent, in what he has said. There are some foods that ought to be labeled, foods that may be called compound foods, and there are some foods that ought not to be sold at all, even if they are labeled. There is a difference in these things. Take the article of pepper which is adulterated with something that has no spice character at all, and it ought not to be sold, even if it is labeled "adulterated pepper." Take a lemon extract which does not contain any lemon oil at all, its sale ought not to be permitted, even if it is labeled. Take candy which has mixed with it some white earth which has no nutritive value at all and which is dangerous to digestion, and that candy ought not to be sold, under any label. In our State, under our food law, we permit the sale of compound foods,—that is, foods like wheat and buckwheat, provided it is labeled "compound flour," because buckwheat flour has nutritive value and wheat flour has nutritive value. Some people may want that kind of food, and if it is labeled it is no deception to sell it, but when you take flour and put earth into it, then you adulterate it in a way that its sale should be absolutely prohibited by the laws of the State. That is also true of any article which is considered dangerous to the public health. In Wisconsin up to 1889 we had some dairy laws that were fairly good. We had a pure food law that was not worth the paper upon which it was written, because it provided that a person should not sell an article for something which it was not if he did it knowingly. We were required to prove intent, and we could not in one case in five thousand. The farmers felt that the dairy laws were not being enforced, and could not be enforced. A farmer did not want to leave his business and enforce a general statute of the state; and they petitioned the legislature for the establishment of a commission, and with the



DAIRY ROOM OF L. W. DYER, ALLEN DAIRY FARM, CUMBERLAND CENTER.

establishment of that commission we secured more stringent laws with reference to all food products. That commission consists of a commissioner, a chemist and a dairy inspector, and my assistant is called for almost every day in the year to go to some factory and test the milk of that factory and see whether the tests are being properly made or not, to satisfy the patrons, and to prosecute any farmer who brings milk there which is below the legal standard. We have prosecuted many farmers and convicted them of skimming their milk, and they have been fined $25 apiece and costs. We go into the cities and do the same things. The dairy commissioner goes around to the cities, and around to the dairies, and if he finds that the farmers do not keep their cows in clean stables, and produce their milk under wholesome conditions, they are prosecuted; and we are getting at the sources of the milk supply in that state. Not only that, but when this commission was organized there were at least 150 licensed dealers in oleomargarine selling their product. At the present time there are but twelve or fourteen of those dealers, and nearly every one of them is complying with the requirements of the Wisconsin law. And so I suggest to you here in Maine, not necessarily that you should have a dairy commission, but that the responsibility of this burden of prosecution should be placed in the hands of one man, and he should be properly paid for his work and held responsible for the efficient enforcement of the laws of this State.

THE POTENTIAL ENERGY OF FOOD.

By CHAS. D. WOODS, Director Maine Agricultural Experiment Station, Orono.

For some years a new factor in cattle feeding has been pushing its way to the front. While our knowledge of the way the potential energy of food is made available to the animal is still limited and in some ways fragmentary, enough has been learned so that, in my opinion, we are at the beginning of an important advance in the science of feeding. Our knowledge is much more definite than when twenty-five years ago the subject of scientific cattle feeding was first expounded before the Maine Board of Agriculture at a meeting held at Wiscasset.

ORIGIN AND DEVELOPMENT OF THE SCIENCE OF NUTRITION.

Before taking up the subject I wish to bring before you—the latest phase of the development of investigation in nutrition of men and animals,—it will, I am sure, be interesting to rapidly review the progress of this science from its beginning.

The first investigation upon this subject was published by Sanctorius in 1614. In these studies the weight of the food and drink was determined, and also the weight of the material excreted in the urine, the feces and the respiratory products. No advance was possible beyond this for 150 years, until the science of chemistry was developed. The most important additions in these years was in the knowledge of different gases. In 1644 Van Helmont discovered carbon di-oxid and a hundred years later (1757) Black identified carbon di-oxid in the air from the lungs. Twenty years later (1774-75) Priestly and Scheele discovered oxygen, and Lavoisier established the relation between oxygen and combustion and in 1777 published the results of investigation showing that in the vital processes which take place in the human body oxygen is consumed and carbon di-oxid is formed in the same way as combustion goes on in a furnace. While his explanation of the process was imperfect, and partly erroneous, the fact of oxidation which he demonstrated as going on in the body was a most perfect discovery. Lavoisier also studied the effect of work, of food, and of low temperature on the amount of oxygen used.

The lack of a proper standard for comparing the processes which take place in the animal body hindered progress. In the meantime, active research was going on in the department of organic chemistry, which resulted in the accurate knowledge of a number of well characterized chemical compounds which occur in the food. Liebig, using this knowledge, formed his theory of nutrition which, while it has been and is undergoing a change, was the first at all adequate attempt to clear up the subject. He recognized that nitrogenous compounds were used for building up the tissues and that the nitrogen-free materials, that is, fats and carbohydrates, were used for respiratory purposes.

Voit and his associates discovered the importance of protein in nutrition, and found that the animal required daily a definite amount of nitrogenous matter in order to sustain life. They found that the protein of the body is broken down and oxidized at the same time that the processes of combustion of fats and carbohydrates are going on and that eventually there comes a nitrogen balance, in which the income and outgo of nitrogen are the same. They found that the nitrogen equilibrium could be reached when only protein is consumed, provided the amount is very large, but that the equilibrium could be obtained with a much smaller amount of protein if fats and carbohydrates were consumed at the same time. They found that if the animal performs work, accumulates flesh, produces milk or wool, or nourishes the fetus, more protein must be consumed than for maintenance, or that an equivalent amount of nitrogen-free nutrients must be supplied. If work is performed nitrogen-free material is essential; if flesh is formed protein is needed.

THEORIES EXPLAINING THE VALUE OF FOODS.

At the time that Liebig was making his studies upon nutrition in Germany, Boussingault, on the other side of the Rhine, called attention to the importance of the nitrogen content of feeding stuffs and believed that this alone could be taken as a basis for estimating their value. On the other hand, Haubner was making investigations which showed that the nitrogen-free material was useful in nutrition and as a result Boussingault modified his theory so that, on the basis of the nitrogen content, feeding stuffs were divided into four groups: hay and straw; roots and tubers; oil bearing seeds; grains, leguminous seeds and oil cakes.

About this time the so-called hay values were introduced as a means of comparing feeding stuffs of different classes and tables showing hay equivalents of different materials were prepared. As hays differ one from the other in nutritive value (as is also the case with other feeding stuffs), as a result there were quite a number of hay equivalent tables prepared by different men from which it was impossible to select the correct one. This theory of hay values, if it had been possible to establish it, would have been a very convenient one, but it was found impracticable, and it was therefore abandoned and for the first time definite experiments were undertaken with different kinds of animals and with the same animals fed for different purposes to learn how much protein, soluble nitrogen-free matter and fat must be fed in order that they should be properly nourished. In 1862 Grouven published what he called normal feeding standards. These were a great improvement over the tables of hay equivalents which they displaced. These standards were a series of formulas based on experiments depending in part upon the general appearance of the subject and in part on slaughter tests. Pettenkofer, Voit, Henneberg and others made digestion and respiration experiments in which the elementary composition of the food, urine and feces were determined, and the respiratory products measured and analyzed. This class of investigations has proved most useful for an understanding of the processes of nutrition. Following along these lines Grouven made many investigations for the purpose of determining the nutritive value of the simpler nutritive materials such as sugar, starch and dextrine. Haubner undertook a series of experiments to learn how much of the different feeding stuffs was required by trusting to the instinct of the animals, and by giving a choice of materials, as, for example, a milch cow was given a choice of oil cake, fodder peas, hay and straw. The amount of each consumed was determined. He found, as from our present knowledge we would expect, that this method was costly and uncertain.

In 1860 Vischoff and Voit made their classic investigations on nitrogen balance. Instead of depending on the weight of the body to show whether there was a gain or loss from a given ration, the nitrogen excreted in the urine was determined and the amount of carbon di-oxid given off from the lungs was found by means of experiments in a respiration apparatus. These experiments were first made with the carnivora, mainly dogs and cats, but later carried on with men. While experiments with men, and with the carnivora, were much more simple than those with the ruminants, nevertheless, Henneberg, Stohman, Grouven and others have shown that with ruminants the general laws of nutrition hold good. E. Wolff devoted many years to determining coefficients of digestibility of feeding stuffs as fed to sheep, horses, etc.

Diverse as have been the theories and abstract as have been the inquiries, two points have always been of importance in these investigations and are important to-day. Theories and ideas of nutrition are of value to the practical feeder in so far as they help (1) to a knowledge of the cost of a method of feeding and its profit, and (2) to devise feeding standards and formulas which can be successfully followed.

THE COMPOSITION OF FEEDING STUFFS.

In order to successfully feed the humblest animal on the farm profound research into still unknown problems of physiology and chemistry is needed. It is because the investigations into the potential energy of foods and the sources of energy of the animal body are closely related that I have chosen this little known and comparatively new subject. To a clearer understanding of this topic and its application to feeding, I will rapidly pass in review the established facts and generally accepted theories which underlie feeding.

By chemical study it has been found that irrespective of the kind and source, the materials which are used for the food of domestic animals contain chemical compounds which can be conveniently grouped into five or six classes. All feeding stuffs contain more or less of water which has, so far as experiments show, no more value as a food than other water. Indispensable as water is to the health and life of an animal, its presence in feeding stuffs makes the feeding stuffs so much the less valuable, since it displaces other nutrients. With few exceptions all materials used as food contain mineral matters. These for the most part are left behind when the substance is burned, and constitute what is known as ash. The mineral matters, such as phosphate and chlorides of lime, sodium and potassium, are of nutritive value, but as they are usually found in excess in ordinary food materials, they are not generally taken into account in nutrition. There have been made very recently some very interesting experiments touching upon the functions of mineral matters in food. For example, it has been found that rats, which are thoroughly well nourished with whole wheat flour, are very incompletely nourished and finally die, when confined to an exclusive diet of bread flour. It is thought by the one reporting these experiments that the animals were incompletely nourished because they were deprived of the small amount of iron which is always found in the bran of wheat. The function of the mineral salts in nutrition is one of many subjects that needs a much fuller investigation.

The three classes of compounds which are chiefly taken into account in considering the food nutrients are protein, fats and carbohydrates. The protein differs from the other compounds in that it contains nitrogen. There are, however, by ordinary processes of analysis, grouped under the head of protein, materials which only partially resemble true protein, either in composition or in nutritive value. Among the true protein compounds familiar examples are found in the gluten of wheat, white of egg, casein (curd) of milk. Materials such as potatoes, roots, and, in fact, most vegetables, contain larger or smaller amounts of nitrogenous matters which are called amides.

These are very inferior to true protein for nutrition. Just as gelatin, the material composing cartilage in animal tissues, is of far less nutritive value than the lean of meat, so these compounds are inferior to true protein.

By fat in cattle foods is usually meant those materials which can be dissolved out by ether. They contain not only the true fats such as oil of meal, cottonseed meal, etc., but in addition there may be various waxy and resinous substances, and in the case of grasses and other green feeds, there will be more or less of chlorophyl, the green coloring matter of plants. The feeding value of the resinous substances and chlorophyl, etc., is not nearly equal to that of true fats.

The carbohydrates include such materials as starches and sugars which are easily and quite completely digested; they also include substances like woody fiber and lignin which have comparatively little value as a food. Woody fiber or cellulose, familiar to us as paper, has the same chemical composition as starch, but is only slightly and imperfectly acted upon by the digestive juices.

It is evident, therefore, that while the nutritive value of feeding stuffs depends upon their protein, fat and carbohydrates content, the character of these compounds is also of considerable importance. In comparing such materials as potatoes and corn, we find that while corn has about ten per cent protein, and potatoes about two per cent, the protein of corn is nearly all true protein, and nearly half of that of the potato is in the amide form, which is far less valuable in nutrition. Hence, although as usually given in tables of analyses, corn has only five times as much protein as potatoes, for nutrition it actually has nearly ten times as much.

FUNCTION OF THE NUTRIENTS.

While the building of all tissues, with the exception of fatty tissue, is dependent upon the presence of protein and cannot take place without protein, it is also burned in the body and is used as a source of energy. It, therefore, has the two-fold function, that of building up and repairing the body, and furnishing the energy to keep the body warm, to do muscular work, etc. Experiments which have been made with carnivorous animals, such as cats and dogs, indicate that animals may obtain all of their energy from protein. This, however, is not an economical use of protein, since the same energy can be obtained from other sources at a much less cost. Fat can be burned in the body and its energy used to keep the body warm and to do work. The same is true of the carbohydrates. Any excess of energy may be stored up in the body in the form of fat. Protein and carbohydrates can be converted into fat in the animal body, but so far as known, protein and fats cannot be changed into carbohydrates, and from lack of nitrogen, if for no other reason, protein cannot be formed in the body from fats and carbohydrates.

THE CONSERVATION OF ENERGY.

While Lavoisier had proven that oxidation goes on in the body just as truly as with fuel in a furnace, and although Liebig pointed out that the fats and carbohydrates were the chief sources of energy, no attempt was made until comparatively recent years, to at all accurately measure the amounts of energy which different food materials contain. In about 1851 Regnault and Reiset made an investigation into the chemistry of combustion in the body and they pointed out the relation between animal heat and the heat of combustion. With the discovery of the law of the indestructibility of matter in nature, experiments were undertaken to find whether this law held in the animal organism and by experiments in the respiration apparatus, where it was possible to analyze not only the food and drink and the air breathed by the animal, but to collect and analyze all of the excretions including that of respiration, it was found that the animal neither gained nor lost in weight, and that there was a balance between the income and outgo of matter and the fact was established that the body can neither create nor destroy matter. Later, when it was found that energy which exists in one form may be changed into another, as that in the mechanical world there was no such thing as the creation or loss of energy, it began to dawn upon physiologists that probably the body could neither create nor destroy energy and that phenomena which had been explained by vital force were probably only the manifestation in another form of energy which already existed. It has, therefore, come to be assumed that conservation of energy, as it is termed, which holds in the mechanical world holds also in the animal. Just as Pettenkofer and his associates proved in the respiration apparatus that the animal body can neither create nor destroy matter, so experiments are being made, notably at Middletown, Connecticut, whereby not only the income and outgo of matter, but the income and outgo of energy are determined. The preliminary experiments show that the energy is derived from the potential energy of the food.

HOW TO MEASURE POTENTIAL ENERGY.—THE CALORIE.

There are a number of different ways in which energy, either actual or potential, can be measured; for example, we speak of horse power which means the ability to lift 33,000 pounds one foot high in a minute of time, and we speak of the foot pound which means the ability to raise one pound, one foot in height in one minute of time. By far the most convenient measure for comparing the potential energy of such materials as food is found in the amount of heat they will develop when burned.

It has been found by experiment that it takes a definite amount of heat, always constant, to raise a given amount of water a given number of degrees. The amount of heat necessary to raise one kilogram of water through one degree of temperature by the centigrade scale has been adopted by physicists as the unit of heat. This is called a calorie. For practical purposes it is the same as the amount of heat necessary to raise four pounds of water through one degree of the Fahrenheit scale. This means that if we should add to four pounds of water the amount of heat that is called a calorie, it would raise that amount of water one degree, so that if it had been at sixty degrees F. it would now be at sixty-one degrees. It is possible by means of an apparatus called the bomb calorimeter to completely burn different materials and observe all of the heat which they give off. In this way we can find the fuel value not only of coal and wood, but of our ordinary feeding stuffs, and this fuel value measures the potential energy of these materials. It has been found that a pound of wheat flour has a fuel value of about 1,650 calories. This means that if a pound of wheat flour were burned the heat generated would be sufficient to raise four times 1,650 or 6,600 pounds of water one degree F.

FOOD DEFINED.—DIGESTIBILITY.

Voit defined food as those materials which build and repair the animal body. This definition would include water, the air which we breathe and the mineral matters, as food. Atwater has defined food as that which when taken into the body builds up its tissues and keeps them in repair, or is consumed in the body to yield energy in the form of heat to keep it warm and create strength for its work. This definition would make materials containing protein, food, since they both build up and repair tissues and are consumed in the body to yield energy. It would include fats and carbohydrates, for while they cannot build up tissues, they are burned to keep the body warm or to do work. It would exclude water and most mineral matters, since they pass through the body unchanged. The two chief uses of the food of animals are: (1) to form the material of the body and make up its waste and (2) to yield energy in the form of heat to keep the body warm, and muscular and other power for the work it has to do. In doing the first of these two duties, that of forming the tissues and fluids of the body, the food serves for building and repairing; in doing the second, that of yielding energy, it serves as fuel.

Materials which pass through the digestive tract unchanged and unacted upon by the digestive fluids are just as much beyond the reach of the body as though they had not been eaten. As has been tersely put, it is not the food eaten but the food digested that we live upon. Recognizing this, for many years chemists have been making what are termed digestion experiments with our common feeding stuffs, and not only are there tables which show the composition of feeding stuffs, but there are tables showing the amounts of the digestible nutrients of the various feeding stuffs. A digestion experiment consists in analyzing and feeding a definite weight of a substance and collecting, weighing and analyzing the feces which contain the undigested matter. The difference between the amount of nutrients eaten and that found in the solid excrement is taken as a measure of the amount of food digested. Simple as this is in statement there are many things which make such experiments difficult, and the results somewhat uncertain. The results which are obtained in digestion experiments do not exactly measure the amount of nutrients of any given food which can be dissolved out of it, but such experiments, in general, give too low results. The practical question, however, is not so much what is actually dissolved out, as how much of the food eaten becomes available to the animal. Digestion experiments, as ordinarily conducted, measure the amount of the nutrients which become available with a good deal of certainty. By experiments of this kind there have been found how much of protein, how much of fat and how much of carbohydrates in different food materials become available to the average animal. Recently the Storrs (Connecticut) Experiment Station, and the Maine Experiment Station have been making digestion experiments with animals where they have burned in the calorimeter samples of the food materials and also of the feces, and they have found the availability of the energy of the food. In the table which follows, there are given the available nutrients and the available potential energy of quite a number of common food materials. As the available energy has been determined only in a few foods, those as given in this table were found by calculation. Protein is not completely burned in the body, but there is a residual product called urea. The difference between the potential energy of the urea and the protein makes it so that there are available to the body about 18.6 calories for each hundredth of a pound of protein. The carbohydrates on an average furnish the same amount, 18.6 per one-hundredth of a pound. When fat is burned there are given off 42.2 calories with each one-hundredth of a pound. These factors have been used in the table which follows:

WEIGHT OF AVAILABLE PROTEIN AND CALORIES OF POTENTIAL ENERGY IN ONE POUND.

Coarse fodders and mill products.	Protein.	Fuel value per pound.	Calories for each .01 pound of protein.
	Lbs.	Calories.	Calories.
Timothy	.036	950	264
Red-top	.049	985	201
Mixed hay (red-top, timothy and clover)	.047	940	200
Hungarian	.049	1045	213
Orchard grass	.049	905	185
Swale hay	.024	630	263
Black grass	.043	835	194
Oat hay	.049	945	193
Oat straw	.014	878	627
Corn stover	.031	915	295
Maine field corn (mature including ears)	.057	1050	184
Maine field corn silage	.018	320	178
Southern corn silage	.010	180	180
Clover hay	.072	875	121
Sweet corn fodder (no ears)	.043	735	171
Corn meal	.058	1450	250
Wheat bran	.126	1070	85
Middlings	.134	1395	104
Ground oats	.089	1220	137
Barley	.079	1460	185
Pea meal	.168	1300	77
Cottonseed meal	.370	1455	39
Gluten meal (high in protein)	.333	1605	48
Gluten meal (low in protein)	.282	1855	66
Gluten feed	.193	1670	87
Linseed meal	.307	1400	46

FEEDING FORMULAS AND STANDARDS.

By carefully conducted feeding experiments in the respiration apparatus, it has been found that the animal body very soon gets its equilibrium, so far as its income and outgo of nitrogen is concerned. If the food contains more protein than has been the custom in the past, the animal for a time seems to store up protein, but after a few days the animal resumes its normal condition, so that unless the animal is actually making growth, the income and outgo exactly balance each other. On the other hand, if the animal receives less protein for a time, the nitrogen excreted will exceed that in the food. This, of course, will make the animal lose in weight, but after a time, unless the ration is smaller than the animal can live upon, the income and outgo of nitrogen will balance each other. The case is different with the fats and carbohydrates, as unless the animal is fed just the amount of materials needed there is a storing up of these materials in the form of fat or else a loss of fat to the body by more fuel ingredient being used than the food contains.

By careful experiment and observation it was thought twenty-five years ago by Wolff that milch cows required 2.5 pounds of digestible protein; .4 pounds of digestible fat and 12.5 pounds of digestible carbohydrates per day. The same experimenter devised a number of other rations which are given in the table beyond. It has since been found, however, that it is not nearly as important that the fats and carbohydrates be in the proportions which he gives as that there should be sufficient fats and carbohydrates to meet the energy requirements of the body. Later investigators have endeavored to measure in pounds of nutrients, this demand for fats and carbohydrates, by combining them to make what has been termed "equivalent carbohydrates" in which one pound of fat is considered equal to two and one-fourth pounds of carbohydrates. This assumption takes somewhat into account the higher fuel value of fat, which is only a little more than two and one-fourth times that of carbohydrates. Inasmuch as part of the energy comes from the protein as well as from the fats and carbohydrates, the feeding standards are somewhat simplified if we give attention to only protein and fuel value. In the table which follows I have given Wolff's and some other suggested standards, placing the fats and carbohydrates in small type and putting in distinguishing type the protein and fuel value upon which the ration depends.

Wolff and other investigators of his time recognized that there was a definite relation between the protein and the fuel constituents of food and this they attempted to measure by the somewhat awkward method of nutritive ratios. This term, nutritive ratio, has come into common use and is perhaps fairly well understood by nearly all feeders. Its defect lies in the fact that it attempts to express in terms of weight a relation between protein and energy. This was the best that could be done at the time. Inasmuch as later research has shown that protein serves as fuel, as well as tissue former, it is necessary to take this energy into account, which the nutritive ratio fails to do. In the place of the nutritive ratio there is included in the table a column which shows the number of calories of potential energy which the food must furnish in connection with each hundredth of a pound of protein, and in the preceding table which gives the composition of ordinary feeding stuffs, the same column is introduced. I also give a number of rations figured from the preceding table based upon the requirements of milch cows, in which the same form is applied. I feel confident that when we get used to these new factors it will very much simplify our calculation of rations.

GRAIN MIXTURES.

Mixture number.	Corn meal.	Cotton seed meal.	Gluten meal.	Gluten feed.	Linseed meal.	Wheat bran.	Ground oats.	Pea meal.	Protein in one pound.	Fuel value per pound.	Calories for each .01 pound of protein.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Calories.	Calories.
1	200		300						.223	1545	69
2	200	100	125						.212	1495	70
3	100	100		100					.207	1525	74
4	200	100	100			200			.179	1355	76
5	100					200			.103	1195	116
6	100		100			100			.172	1375	80
7	100			100			100	100	.127	1415	111
8	100	100				100			.172	1340	78
9					100	100	100		.174	1230	71
10	200				100		100		.128	1385	108
11	300		100			100			.127	1400	110
12						100	100	100	.128	1200	94

EEDING STANDARDS PER DAY AND PER 1000 POUNDS LIVE WEIGHT.

	Nutritive (available) substances.			Available fuel value.	Calories for each .01 pound of protein.
	Proten.	Carbo-hydrates.	Fat.		
	Lbs.	Lbs.	Lbs.	Calories.	Calories.
Oxen at rest in stalls	**0.7**	8.0	0.15	**16820**	**240**
Oxen moderately worked	**1.6**	11.3	0.30	**25260**	**158**
Oxen heavily worked	**2.4**	13.2	0.50	**33130**	**130**
Horses lightly worked	**1 5**	9.5	0 40	**24150**	**148**
Horses heavily worked	**2 3**	12.5	0.80	**30910**	**134**
Milk cows	**2.5**	12.5	0.40	**29590**	**118**
Fattening oxen	**2 7**	14.8	0.60	**35080**	**130**
Fattening sheep	**3.0**	15.2	0.50	**35970**	**120**
Growing cattle, age 3—6 months	**3.2**	13.5	1.0	**35280**	**110**
" " age 6—12 months	**2 5**	13.5	0.6	**32290**	**129**
" " age 12—18 months	**2.0**	13.0	0.4	**29590**	**148**
" " 2 years and over	**1.6**	12.0	0.3	**26560**	**166**

RATIONS PER DAY FOR 1000 POUNDS LIVE WEIGHT,

MADE UP FROM THE COARSE FODDERS AND GRAIN MIXTURES IN TABLES I AND II.

Ration number.	Materials and weights used for each ration.	Available protein.	Available fuel value.	Calories for each .01 pound of protein.
		Lbs.	Calories.	Calories.
1 Milch cows.	Flint corn silage (ears glazed)... 30 lbs. Timothy hay.......... ....10 " Grain mixture No. 1...... ... . 7 "	2.5	29930	120
2 Milch cows.	Flint corn silage (ears glazed)....30 lbs. Mixed hay.............................10 " Grain mixture No. 2................ 7 "	2.5	29500	118
3 Milch cows.	Southern corn silage (no ears)....35 lbs. Mixed hay ....10 " Grain mixture No. 3...... .... 8 "	2.5	28000	112
4 Milch cows.	Timothy hay.... ....10 lbs. Corn stover. ....10 " Grain mixture No. 4............ ..10 "	2.5	32300	129
5 Milch cows.	Hungarian hay. ....10 lbs. Sweet corn fodder. ....10 " Grain mixture No. 4................ 9 "	2.5	29800	119
6 Milch cows.	Clover hay..... ....20 lbs. Grain mixture No. 5................10 "	2.5	29470	118
7 Oxen heavily worked.	Mixed hay .... 5 lbs. Oat hay... .... 5 " Oat straw. ....10 " Grain mixture No. 6............... 10 "	2.4	32100	134
8 Oxen moderately worked.	Southern corn silage..............20 lbs. Mixed hay .... 5 " Oat straw ....10 " Grain mixture No. 7... ....10 "	1.9	31350	165
9 Horses heavily worked.	Oat hay........ ....15 lbs. Grain mixture No. 10...............12 "	2.3	30810	134
10 Horses moderately worked.	Timothy hay.........................15 lbs. Grain mixture No. 11.... ....12 "	2.1	31110	148
11 Young growing cattle.	Mixed hay ....20 lbs. Grain mixture No. 9 ....10 "	2.7	32460	120
12 Growing cattle.	Mixed hay ... . 10 lbs. Corn stover......................... 5 " Southern corn silage..............15 " Grain mixture No. 12...............10 "	2.1	30740	146

PROTEIN AND FUEL VALUES THE ACCURATE MEASURE OF THE NUTRITIVE VALUE OF FOOD.

Fuel values have another unusual important bearing from the standpoint of the chemist, and consequently from that of the practical feeder as well. As I have shown earlier in the paper, carbohydrates are made up of a large number of different compounds, differing not so much in their chemical composition as in their availability to the animal. The same thing is true of the ether extract, so that if a pound of fat represents the ether extract of hay its feeding value is less than if it represents a pound of the fat of corn or of oil meal, since the extract from hay will contain not only true oils but waxes, resins, chlorophyl and allied materials. No methods have yet been devised which will either accurately or readily distinguish between these different classes of compounds. With the nitrogenous constituents of feeding stuffs, however, the case is different; while true protein is far more valuable than amide nitrogen, it is possible with a good deal of accuracy to distinguish between these two classes of compounds by chemical analysis. Furthermore, there are no more accurate determinations made in a laboratory than that of fuel values, hence the use of protein and fuel values as a measure of the value of feeding stuffs not only simplifies the matter, but makes a far more accurate expression of the value of a feeding stuff and makes it possible to accurately compare very different classes of food materials.

L. O. STRAW.

This subject, as you all know, is scientific, and I am going to be frank and tell you that I know but very little about scientific matters. I do know, however, that I consumed my mother's food with a great deal of energy. I have no doubt that the time will come when we shall look back to this very able discussion of the subject by Professor Woods, and adopt many of the things which he has presented to-night. It is, as it seems to me, a little beyond us now, like many things that are new to us, somewhat beyond our reach, but as we go on, time develops these things and we become better and better acquainted with them. To-day we simply know that to feed our animals the best feed possible gives us the best results, and there are but very few of us who know just how much to give to make a balanced ration that we hear so much about. Experience teaches us that different animals require different amounts of food. We know very well that there are plenty of farmers who are feeding to-day five and six feeds of hay, and are keeping their stock in very fine condition. We are told that that is all nonsense, that we should feed two feeds, and some of us may have adopted that rule. We have discovered that it requires about so much substance to furnish the materials necessary to grow an animal, the materials necessary to make our milk product, and we learn this from our observation and our experience.

There are many here who can tell me very much about the feeding values and the different amounts of feed that animals require. I know that we are hardly particular enough in the study of our animal food, and the majority of our farmers are neglecting those foods that would be a saving to us in dollars and cents. We must outgrow the importation of so much western feed. The farmers of Maine must learn to grow more feed, they must learn that their farms can produce it, and should be made to produce it. The reason that so many of our farmers are at a standstill to-day is simply from the fact that they take so little thought of the pamphlets that are sent broadcast throughout the State, portraying in such an excellent way the different food values. These are the result of a great deal of study, and our Station officers are entitled to a great deal of credit for their assiduous work in working out these pamphlets and distributing them throughout the State.

REMARKS BY C. O. DODGE OF NEW YORK.

For the benefit of the butter-makers I have taken the liberty to copy a little slip that I cut out of a dairy paper in Kansas. It is made by one of our government experiment stations, and Dr. Fisher is the author of it. It will give you an idea of something about milk. Milk left in the milk-house after it comes from the barn, and is strained, has a temperature of about 94 degrees, and the acidity is 184. If that is left over night, in the natural order of things, without any particular care, the next morning the temperature is 75 and the acidity is 296; and the number of bacteria per cubic inch is 125,057,972. Draw the milk in the same manner the next night, aerate it and cool it down to a temperature of 62, with an acidity of 184; the temperature the next morning, you will note, is 63 degrees, it has gone up one point from where you left it the night before, and the acidity is 194 instead of 296, and the bacteria have been reduced from 125,057,972 to 24,678,103. So you see there is a difference in the bacteria left in that milk, and a difference in the acidity, from the low temperature. Now the third night we will take the same milk and cool it down to 62, which, it seems, is about as low as anybody can get it on the ordinary farm, and the acidity is 204. The temperature the next morning, after the milk has been left in a tub of water with a piece of ice in it, is 61, you have reduced it one point; and the number of bacteria is 8,837,428. Just think of it! Reducing the temperature one point has put the bacteria down from one hundred and twenty-five millions to eight millions.

We in New York keep getting milk farther and farther away from the city, until we are liable to go a thousand miles if we keep on. Now the danger point of the milk souring is 305. If you attempt to ship that first milk, treated in the old-fashioned way, very far it would sour before it got there, whereas this next milk which you have cooled and taken proper care of will keep for a day or two, and the next milk where you have still further reduced the temperature will keep much longer. You can understand that the temperature going down one point makes quite a difference; you have reduced the acidity finally to 189, and you see it is the acid in the milk that makes it sour and makes it spoil. Some milk was sent to me at my home in New York by men who are at this milk business all the time, and it took me one week to sour it.

Now I want to speak to you about a starter, because if we ever develop flavors in our centrifugal butter, which is the coming butter, we must use a starter. Minnesota, I believe, is making as fine a butter as is made in the world, and our government, in all of the experiment stations, is doing something. They are learning very fast, and they want you to spread this knowledge. There is no patent on it, they want you to spread it far and wide.

One word about the old-fashioned dairy butter and the new butter that is coming in. All the butter-makers who make these large packages of butter use a starter, and I do not know how else to describe a starter except this: when your mother made yeast she saved some of the old to start the new, and you can put it that way if you like. You can take some of the skim-milk, as the bacteria grow faster in the skim-milk than in the whole milk, and let it sour and use it as a starter. If you take this skim-milk and keep the temperature above 75 you will get all the life that is necessary to make a fine starter, and it will be just as acid as you can possibly get it. You take that kind of a starter and put it into your separator goods and that acid will help to develop the flavor.

I have here a tub of butter sent in from somewhere outside of the State, and a tub that is the best I could find out of the ninety-one packages of butter; and then I have a package of butter that is very poor. I learned incidentally that the lady who made it was once upon a time a prize winner. The ill luck is something that is liable to happen to any one of you if you do not understand perfectly how to take care of cream properly, how to aerate it, etc. I presume that sort of an accident can occur to anybody, no matter how fine a butter-maker he is. You have some pretty low scores, but I do not see why you need to feel bad about it. You will find that from all over the United States the butter has been coming into New York quite poor for quite a while, and we have a hard time to get people to treat the cream rightly and give us the right kind of goods. You want to know where you stand. Many people have been spoiled by getting a big score and resting on that forever.

Ques. Do you mean to say that the score is averaging lower throughout the dairy world this season than other seasons?

Ans. I believe that the scores are very low, and then you want to understand that we get more critical year by year. Butter that we would have scored a certain number of points four or five years ago, we might be more particular with now.

Now I will try to show you as best I can these two tubs of butter, the one that scored ninety-five and the one that scored eighty-two. Here is the piece of butter that I scored ninety-five. You can feel something of the character of the butter as you push in the tryer. Its appearance is all right, there is a nice, clean flavor to it. You can smell the cream, you can smell what that butter was made of, and it does not gain the flavor, as butter sometimes does, from the salt, it gets the flavor right on its own merits, as it were. There is very likely half an ounce of salt to a pound of butter. I marked the flavor forty-five and all the rest perfect. The grain is all right, the salt is all right, and of course the color is all right. I do not very often criticize the color, because I take it for granted that you know what kind of color you want. You are trying to please your customers, and that is your business. The only instances where I scored off the color were where I found it mottled or wavy.

Ques. Why didn't you give it 100?

Ans. You cannot give 100. If I had seen all the butter in the United States at one time I might perhaps give 100, but that is out of the question. I have seen more perfect butter than this.

Ques. What do you mean by flavor?

Ans. It is difficult to describe flavor. A good many people who eat strawberries and cream when they want to say that something is really elegant say that it is just as fine as strawberries and cream. There is a perfectly delicious flavor to nice cream. There is another flavor to cream, you know, that is not nice, it is a bad flavor. It is the flavor that you get in cream that has rotted down, and has not been properly aerated, etc. You have eaten cream that will tickle your throat; there is something bad about it. There is a delicious flavor to good, sweet cream, and the nearer you get to that flavor in the butter the better. That is the only way that I know of to describe flavor.

Ques. How do you designate between forty-five and forty-six?

Ans. To the man that is looking at butter from all over the United States, as I have been doing for years, there is a little bit of a thing that comes that will give him the difference of a point or of half a point. If you wanted to take four or five pieces of butter and enter into a contest with four or five of the very fanciest creameries, and they had all been ripening the cream and separating it at certain temperatures and making that butter down to a nicety, so it would be published and everybody would know just how the milk was drawn and how it was separated, and everything else about it, and you put those pieces of butter before a man who understands the judging of butter, if there is a point or a half point of difference he can tell it. There is nothing in this wide world that speaks so plainly to the man that studies it and understands it as a piece of butter.

Here is another piece of butter that shows what it is, right on the general appearance of it. The grain is short and it is salvy; it has a perfectly unnatural look.

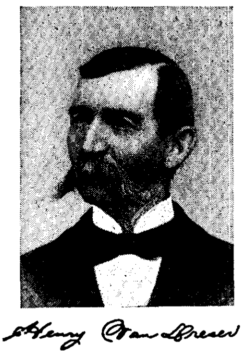
Ques. Please state why the grain is short?

Ans. I dare say that the temperature has something to do with it. Being salvy would indicate that it was overworked. The general get-up of it is against it. That identical thing might occur to one of the very best butter-makers in the United States to-day. Something has taken place in the cream. I would not be at all surprised if that cream had been smothered. I do not know who made this butter, but I would not be at all surprised if it had been taken care of so carefully that it had been shut up in something, and in that way had developed that flavor.

I have another tub of butter sent in from some one outside of the State which would be recognized by every dealer in the United States who deals in butter from all over the country, and the first thing he would say, letting the butter speak for itself when he put it to his nose, would be "separated." There is a flavor in that piece of butter that speaks of the separator. I do not know as I can explain it, but, strange as it may seem, there is a flavor that is different from that of a piece of gathered cream goods. A piece of gathered cream goods can have a nice flavor, a pure flavor and a clean flavor, but this has an aroma that everybody seems to fall in love with. The gentleman evidently made that butter in a very great hurry and has got too much moisture in it in order to get the proper solidity, but it has the essentials, it has the flavor.

FEED, CARE AND DEVELOPMENT OF THE DAIRY COW.

By Henry VanDreser, Cobleskill, N. Y.

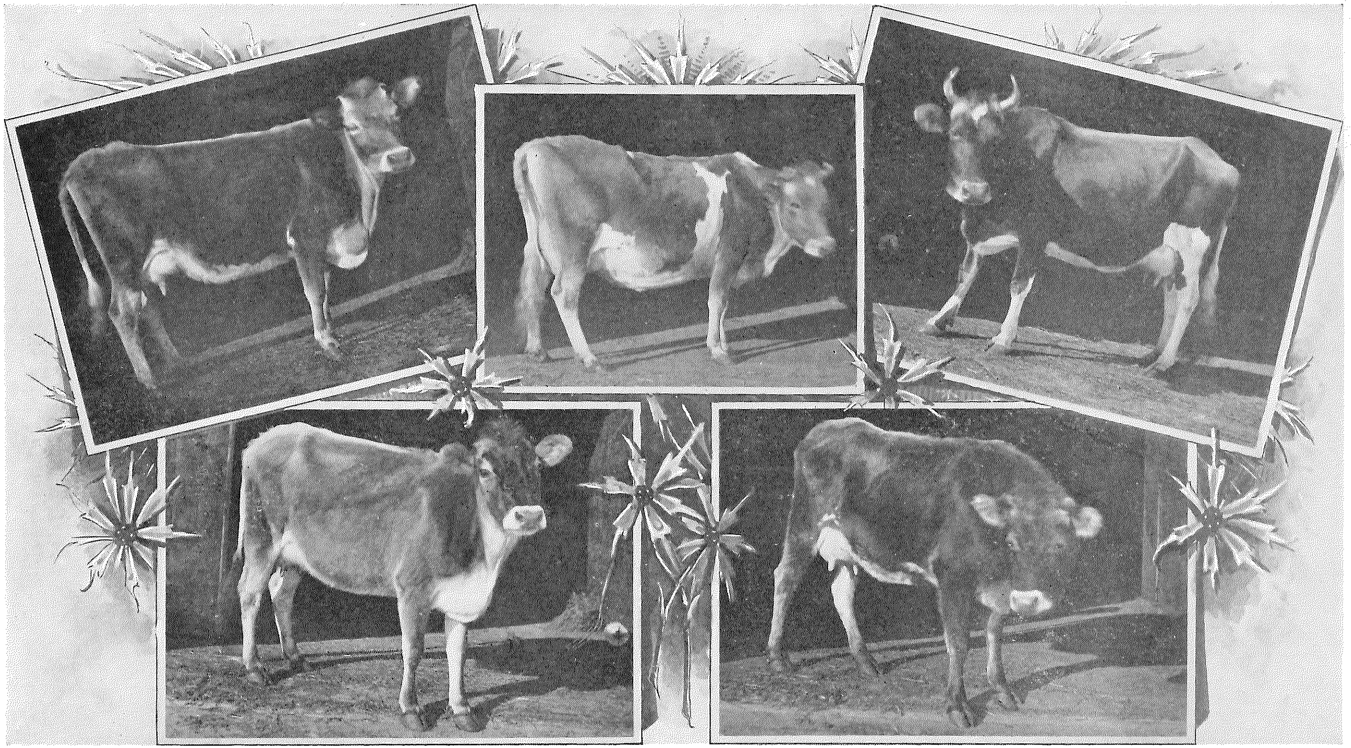


Ladies and Gentlemen: We are here this morning for a purpose, and I hope that by the going down of the sun we shall accomplish that purpose. I appear before you as a stranger. I never had the pleasure of looking into your faces until yesterday, but I feel acquainted with you because you are interested, with me, in the dairy industry; and whenever I see a man who has a dairy cow in his stable and is interested along that line, I regard him as a friend and I am glad to take him by the hand. Ignorance of our business enslaves us; the truth makes us free. It is said that no human being receives credit for more than two original ideas during his natural life. The mind is developed by an interchange of thought, by an interchange of ideas, by coming together as we have this morning for the purpose of talking over matters pertaining to our business. In this way new avenues of thought are developed and new enterprises engaged in, and we are better prepared to fight the battle of life as the days come and go.

I am interested in the dairies of the United States, and I am very much interested in the dairy cow personally. She is the foster mother of the human race. Her milk is a perfect food for the support of human life. Her milk, her cream, her butter, and her meat, all her products and every portion of her body can be utilized for a purpose. Through the dairy cow the poor are remembered, the gospel is supported, our children are clothed and educated. She is a mortgage lifter; she is a public and a private benefactor. Now how is she treated for what she is trying to do for humanity? Often she is allowed in the cold months of October and November to go out upon the cold frozen soil and lie there until morning; dwarfed in her milk flow, pinched and chilled, put into winter quarters thin and neglected, and often allowed to lie upon the cold floor during the winter months without bedding. That is wrong. Now in my own state, there are only 125 pounds of butter made per cow. and only about 3,000 pounds of milk produced, upon the average; and as I go through our own state and visit other states, when I feel the condition of our own state my heart is made sad. Who is to blame for the condition of things? Every man who allows that condition of things to exist in his dairy is personally to blame, and it is a duty that he owes to his wife and family to better that condition, and he has no excuse, because there is a remedy and that is the butcher's block. God, in his wisdom, created the lower animals in a crude state for us to develop intelligently. Now if we do not do it intelligently we do not fulfill the mission that God designed for us to fulfill If we want to make dairying profitable and our homes attractive we should be educated along the lines of our business, and we should be liberal. We should believe in "the survival of the fittest," and realize that the best is none too good to breed from What is the trouble with the American people to-day? We go to bed tired, we farmers, and we get up before we are rested. You remember in your boyhood days it required muscle to swing the scythe, but here in the close of the 19th century, with all the agricultural implements of the age, with all the dairy appliances of the hour, farming is made comparatively easy. Take a man physically overtaxed and he is mentally dwarfed. When we are tired out we cannot think intelligently, we cannot govern our business as we could if we were vigorous physically. Let us look this thing squarely in the face. What shall we do under the circumstances? Let us simply do this,—let us exercise the muscle less and the brain more; for it is the brain that touches the button that lifts the lever that moves the machinery of the world.

The dairy cow is a machine, and she was made for the purpose of transforming food into milk and butter, and the dairyman's aim should be to transform the largest amount of food into milk and butter with as little waste as possible. In order to run that machine successfully we should be familiar with its mechanism. We should study the conformation of the dairy cow, and her characteristics, and see if knowing her better will not be to our financial good. The American people have developed the dairy cow in the United States in the last twenty years. They have developed the dairy breeds more in twenty years than was done in the old world in 100 years. Here on the chart before you is Mary Ann of St. Lambert, that well-known Jersey cow. She astonished the people by coming to the front and making 963 pounds of butter in 365 days. The news struck old England like a thunderbolt, and the vibrations were felt upon the Jersey Island. And here we have Pauline Paul, that well-known Holstein cow, the queen of the earth. No other cow, living or dead, has ever produced 1,153 pounds and 15 ounces of butter in 365 days. When the news struck old Holland she lifted up her hands in holy horror, and exclaimed, "America is ahead! Breeding is in its infancy and the end is not yet." So you see, Brother Farmers, at the close of the 19th century, allowing that breeding is in its infancy, there is something for you to do and there is something for your sons to do, and that is to develop the dairy cow and develop her intelligently. We think too little of our business; we have too little confidence in our breeding. We should have more confidence in our work and be more interested from start to finish. Then our pathway is made easy, work is made light.

The dairy cow, as I said, is a machine, and she was made for a certain special purpose. Now let us study her conformation, let us be familiar with her requisites. A dairy cow now stands before man as a subject of criticism. How different with humanity! We have the power to conceal our imperfections, the dairy cow has not. Here she stands, she is an open book. Let us familiarize ourselves with her qualifications. What are the characteristics? Her head should be symmetrical; she should be broad between the eyes; the eyes should be full and expressive; the ear should be of medium size, the hair plentiful, the inside of the ear filled with secretions. This is an indication of the butter fat content in the animal's body. Her face should be slightly dished, the facial veins should be prominent; she should be slightly of a nervous temperament; the bridge of the nose should be flat, the nostrils should be large and her mouth and lips should be broad and heavy. That is an indication that the animal has the power



SNIPE, 5 yrs.
Milk tests 6.2 per cent.

SPOT, 11 yrs.
Milk tests 5.8 per cent.

DOT, 5 yrs.
Milk tests 5.2 per cent.

ETTA, 9 yrs.
Milk tests 6 per cent.

BONNY PINK, 3 yrs.
Milk tests 5 per cent.

PART OF DAIRY HERD OF R. W. ELLIS, EMBDEN.

to assimilate what she eats. It is an indication of constitutional vigor. The neck should be thin; she should be of a wedge shape; she should be deep through the heart; the ribs should be well sprung, each and every rib from the shoulder better sprung until the hip is reached. That gives ample storage capacity, and that is what is needed in the dairy cow. She should be broad across the hip and still broader across the huckle. If we buy thoroughbred animals narrow across the huckle, with broad hips, when they are out at pasture the udders will first go this way and then that; they do not give nearly as much milk as they would have if they had been broad across the huckle, and could carry with ease and comfort the large udder. For that reason I would be very particular in breeding to breed animals broad across the huckle. The bone of the tail should be large at the setting, and it should drop below the gambrel, accompanied with a long, soft switch. The secretions of the skin should be oily and abundant. I want to call your attention to this point,—an open organization for a milk cow, a close organization for a beef cow; one pulled apart, the other driven together. You cannot put the two cows into one package and make her worth anything for you at all. She is either a good milk cow or a good beef cow. Let us put our fingers upon the vertebræ. If the indentations are so pronounced, so perceptible, that you can put your finger into them, it is an indication of an open organization. We will put our fingers upon the shoulder pits. If this indentation is pronounced we can detect it very easily, and it is another good indication. Here is the udder cord that holds the udder to the body. That is made in proportion to the capacity of the animal, and when we are looking a little carefully, and pass the hand back and forth, we can detect the size of the udder cord. If it is a tiny cord, when the calf develops into cowhood the cow will give you only a small amount of milk. A small udder cord is an indication of a small flow, a large udder cord is an indication of a large flow. Now we will examine the udder, if you please. The udder should be capacious, the quarters well placed and the teats well set, and of medium size. You should avoid a very fleshy udder. I made cheese for twelve years at our own home factory and I found this to be the universal fact: cows that carry fleshy udders were more susceptible to garget.

The farmers used to say to me, when they would drive up to the door in the morning, in the month of May when the weather was very chilly,—a shower had come up and it had turned cold, "Another case of garget." Sometimes there were two or three cases in one herd. They would say, "I wish you would come over and help me out," and as a rule I went, and I found this condition of things always to exist,—where a cow carries a very fleshy udder she is more susceptible to garget. She gets that largely by inheritance, and for that reason if a cow is subject to garget I am very careful about keeping her calves. When the milk is drawn I like to see the udder flexible and soft, so you can pull it right back and tie it in a knot. In order to detect the butter fat concealed in a cow's body by manipulation, you want to lay your hand upon the body and push it towards the head. If you can detect the secretions at all, or if on turning the hair back upon the shoulder it is filled with little yellow dandruff that glisten like gold, it is an indication of quality. The skin should neither be too thick nor too thin. Avoid a papery hide, as it is an indication of a very weak constitution. Take hold of the skin and pull it back and let it snap against the rib, and if it is elastic and life-like, and has that peculiar oleaginous touch that indicates butter fat, you can make no mistake. A good many people never look at the flexibility of the animal at all. They stand off, from 125 to 200 feet, and make up their minds as to whether it is a good cow. We should study the general conformation of our dairy cows if we want to make dairying a success.

Now we will study the milk veins. The udder should be capacious, and those udder veins are an indication of milk force. The larger and longer and more crooked the milk veins and the greater the number of holes at the end, the better the cow. Look at Mary Ann of St. Lambert. You see she has an escutcheon of highest development. It is not bristly, it is soft. Here are the ovals indicating milk force and persistency. She had two beautiful ovals about the size of the ball of my thumb, rich in quality, just like velvet. That was an indication of quality. And her milk veins were very knotty and well developed, and the secretions of her skin were abundant. Why did she make that large amount of butter? Simply because she could not help it; she was bred that way, and blood tells.

Let us look at Pauline Paul, and trace her milk veins. See how pronounced they are, and how crooked. I have here also the cow owned by Mr. F. E. Dawley of Fayetteville, Dot's Lilly. She is a Jersey cow. Her eyes are full in expression, her head is dishy, her nostrils large, her lips and mouth broad and heavy. See what an open organization! Look at that capacious udder and those udder veins which are so prominent, and those milk veins! See how her chest extension buries itself under the muscles of the chest! A perfect specimen of a dairy cow. That cow produced last year 10,000 pounds of milk, five per cent butter fat. In my boyhood, when the Jerseys were first brought into this country, they hardly gave milk enough to feed a baby. See what has been brought about by these few years of development. Plenty of them are making fifty pounds of milk a day, a large flow rich in butter fat. This has all been brought about by studying the general conformation of the dairy cow and the characteristics required.

I want to say to the farmers right here that we pay too little attention to our breeding. We must say to ourselves, we are in this business to stay; our family's support depends upon our success. I want to say to you this: There are too many scrubs in the United States. I know how it is in my own state, and I am sorry that it is so. But the farmers are waking up to a sense of duty, and they are breeding a great deal better than they did. And I want to say to the fathers and mothers here to-day, if your sons and daughters are in scrub company it means their moral ruin, it is simply a question of time. And if you have a herd of scrub cows in your stable to-day, it means your financial ruin, if you have enough of them. Now what shall we do under the circumstances? Let us discard the scrubs and get into better company. Just as soon as there is new blood infused, a man is in better company, and he will begin to read and think and act accordingly. You see the great necessity of selecting good individuals to breed from. It is not expected that all men can have all thoroughbred cattle, but we can do the next best thing. We can go home and look over our dairy cows, discard the scrubs, take them to the butcher's block, keep our best grades and then select a good sire. That is what we must have under all circumstances,—a good sire. Now let us familiarize ourselves with the characteristics of a good sire. It behooves every breeder of thoroughbred cattle to make no mistake in this, as it is the starting point. He must study the mechanism and the characteristics of the breeds, and then he can breed to a certainty, beyond the possibility of a doubt. In the early days Aaron tried to do this work without so much as inviting Divine assistance, and Moses, being one of the examining committee, decided that the animal was not worthy of registry and so he burned it in the fire and ground it to powder and cast it upon the waters. If that policy was acted upon to-day it would be very much better for the farmers. I get letters from nearly all over the United States asking me what breed of cattle it is best to invest in. The question answers itself, and I want to say this: If a man has a natural aptitude for domestic animals, a natural love for the dairy, then he will succeed; but if you reluctantly go to the barn, and feed your cattle as a matter of habit and have no love for the business, then for God's sake, and for your own sake, and for your kinsfolks' sake, quit the business, for you never will succeed. But if you breed intelligently, taking the best you have and purchasing a thoroughbred sire, you will succeed beyond the possibility of a doubt.

We have made up our minds that we will discard the scrubs and purchase a thoroughbred sire. I have had letters from men asking for a thoroughbred sire, and they would say that if they had a Jersey they wanted him solid in color, registered, with a black tongue and switch, just as if that covered the whole business. An animal may have a pedigree that reaches over into the old world or upon the islands of the sea, but if it is not accompanied by individual merit it amounts to nothing. It is individuality that we must study. What are the characteristics that we want? His head should be masculine, it should be a little shorter than that of the dam, it should be dished; he should have plenty of nervous energy, but should not be ugly; the eyes should be full and expressive; he must be low on the ground, heavy in the barrel, well chested, free from dewlap and clean in the throat. I would not breed from a thoroughbred sire unless he had four well placed teats and double extension milk veins. Life is too short. I saw some calves only about two months ago, the breeding of a sire that had no rudimentaries at all, and three of his calves in the neighborhood where he was kept for breeding purposes had only two teats. If we purchase this animal to reproduce himself, we want him to be prepotent, and for this reason he must have the general characteristics which are necessary in the make-up of his progeny. The secretions of the skin must be oily and abundant, and it must be soft and mealy to the touch. You can purchase such sires all over the United States. They are for sale and I want to say that if there is a man here who is carrying an indebtedness, he cannot afford to breed from scrub stock. I do wish the legislature in the state of New York would pass a law in regard to breeding from grade animals, because it is a curse to the nation, and if a law were passed making it a misdemeanor I think it would be a great deal better for the farmers of the state. You know how it is in France. The French coach horse is bred according to the rules of the government, and if he does not pass a certain number of points he is not used for service. I hope the day is not far distant when similar regulations will be enforced in New York in relation to cattle, because I am so thoroughly disgusted with these scrub animals. Do not ever purchase a thoroughbred scrub. You have no confidence in him, and your money is wasted.

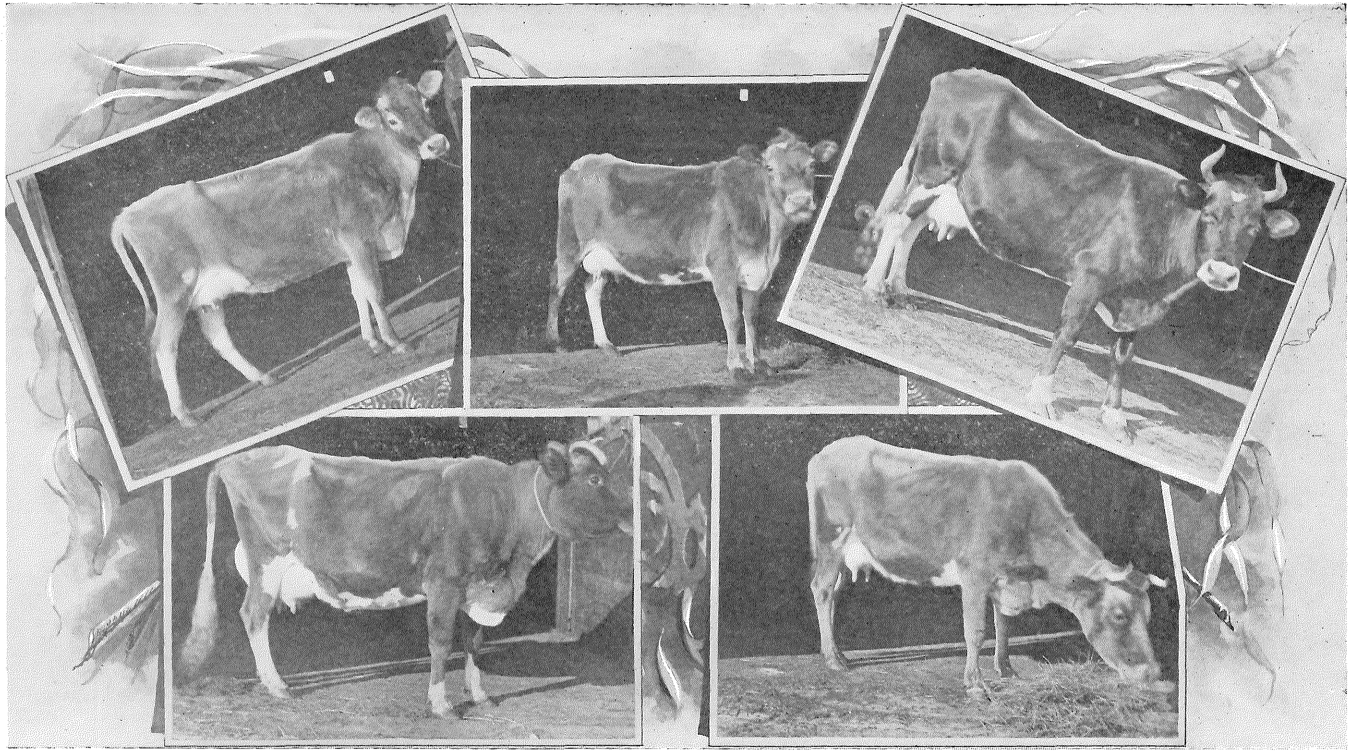
With all the characteristics of which I have spoken, you want to remember this,—that you must have plenty of constitutional vigor, and you can detect the constitution of an animal by his gait and his gimp. It is so in the human race. I do not need to tell you that I have plenty of constitutional vigor, it is self-evident. We want something of a nervous temperament in the dairy cow; a sluggish, lazy cow is of no use. You want the nervous temperament. Take a sire of that description and he will have the power to transmit his nerves to his progeny. The sire is more than half the herd, a cow can only transmit her qualities to one calf during the whole year.

We will say that we common farmers have discarded the scrubs and got our best grades, and have invested our money in a thoroughbred sire with the characteristics I speak of. He has cost us money, we are more interested, and we begin to think. We take the lantern and go to the barn; that means better care. And we wait anxiously, when the calf is to be dropped. I believe the destiny of the calf is sealed before its birth. I will tell you the way we do at home. We turn that little calf on its back and examine its udder. If it has four well placed teats and two rudimentary teats, it is an indication of milk force. Then we pick it up and open its mouth and examine its teeth. If it has six or eight well developed milk teeth we consider that calf well born, and a calf well born is more than half raised. That calf has brains; that calf is on earth for a purpose. That calf is hungry, and now we will feed it. We will draw the milk from the udder into a pail. That is the kind of a calf to raise.

But there is another calf dropped this morning. We will turn it on its back and examine it. Its udder is nicely developed; but we open its mouth and it has two little tiny teeth, just put through the gums, hardly perceptible. That is a fool calf and you cannot afford to raise it. That calf will drink to-day, and will feel indisposed to-morrow, troubled with indigestion. That calf's mother did not have constitutional vigor enough to thoroughly develop the calf. She did not have vigor enough to put the teeth through the gums previous to its birth. It has a weak constitution, is physically incapacitated. That is the great trouble to-day all over the United States. These cows are so susceptible to all the diseases that the bovine race is heir to. That is the reason that we have so much tuberculosis. If we will just have these points in view when we select a calf,—plenty of brains, plenty of appetite, well developed, with constitutional vigor, and keep those calves, and discard the others, we shall improve our herds. Or if we have one with a fair appetite, I will tell you what we can do. We will take those with plenty of constitutional vigor, great power of digestion, skin mealy and soft, escutcheon well developed, milk veins pronounced and crooked, and put them into a stable by themselves, and have another stable for the inferior ones close by the roadside. You know there is a class of people that are dissatisfied with everything on earth. They denounce anything of a progressive nature, they are probably denouncing this meeting to-day, plenty of people, perhaps within a stone's throw. Just put your inferior calves into this stable by the roadside, and when a man of this class drives up to buy something, sell him one of these, and then he will have something to find fault with; but always keep your best.

Fathers, do you realize that the boys of to-day are to become the farmers of the future? It is true. Do you want to interest them along the line of better agriculture? If you do, what you want to do is this,—infuse some new blood into your stock. Get some thoroughbred eggs, or a calf or a lamb or a colt, and unawares they will form a love for agriculture, and they will be the pride of your heart in your declining years, and they will love the homes and the farms that you have worked so hard to pay for. If you do not believe it, try it. The boys of to-day, with keen perceptives and full of hope and vigor, love to breathe an atmosphere impregnated with the germs of progress. As it has been my pleasure to be in nearly every state of the Union and in every county in my own state, I have known that to be a fact. Interest a boy, and work is not irksome but it is a pleasure. But when people bring up their children to believe that there is nothing so degrading as farm work, the chances are that they will leave the farm, and they ought to leave it.

The best breed of cattle is a matter of taste. In any of the dairy breeds you can make no mistake. You might as well ask me, if you are an unmarried man, whom I would advise you to marry as to ask me what breed of cattle you shall purchase. I happened to fall in love with a little Scotch girl, and I like her, but I do not say there is nobody on earth good except the Scotch girls. So it is with the dairy breeds. We will succeed with those we are in touch with. Ask an Irishman what breed he is in love with, and he will tell you the Kerry. She is called the poor man's friend. Her eyes snap, and if you kick her she will kick back. Ask a Scotchman what breed of cattle he is in favor of, and he will tell you the Ayrshire cow, a native of Scotland. She has an open organization, and has been bred for the purpose of milk production for hundreds and hundreds of years. The type is fixed and you can breed to a certainty. He has a right to love her. If you give her a good ration, all that she can assimilate, instead of applying that grain to her own system and starving her calf, as an animal of the beef type would do, she will make you from ten to twelve thousands pounds of milk at the expense of the system, and give up her all to bless her owner. If you ask me what breed I am in love with, I will tell you the Holstein. It may seem strange, but nevertheless it is true. She has a good warm place with me, and she got it by inheritance. My grandfather was born in Friesland, Holland, and grew up there and studied for the ministry; then he came to this country and preached in Schenectady for seventeen years. In my boyhood days I used to sit in his lap and he told me of the beauties of Holland; its nutritious grasses, and its pretty girls. I said that I wanted to see something from Holland besides my grandfather, and I did, and among the many things I saw was the Holstein cow. My brother and I had purchased a farm in Cobleskill. We were to pay for that farm $14,250. We were keeping about thirty scrubs and taking our milk to the factory, and when the first day of April came we could not pay our interest. I shall never forget the first day of April, when my brother and I walked down into the cow stable and counted our money; and with all our economy we did not have money enough. There had to be a revolution of things, and when we attended a fair and saw a Holstein cow we thought we had found out the way. We went home and put a second mortgage on our farm, of $1,050 more, and invested in Holstein cattle. I shall never forget when we came home with those cattle and unloaded them, and our wives came to the gate and helped us put them into the stable and admired them. My brother and I took the lantern and went to the barn after supper, and looked over the investment, and we felt better satisfied than we ever did before; and before we left that stable we named that farm. We called it the "Eureka Stock Farm," owned by VanDreser brothers, with two mortgages on it. And if there is a man within reach of my voice that has two mortgages on his farm, if he thinks too little of that farm to name it, God pity him! For he does not think as much of his farm and his home as he should think. There is no place like home for true happiness, when love lights the fire and spreads the board. The earth is ours, we get it by inheritance; we came up out of the earth, we are a portion of the earth, we go back into the earth. And every man that hears my voice, if he has his health, may own a portion of it if he will. I want to say to you to-day, I am not here in behalf of the people



KATE, 4 yrs.
Milk tests 6 per cent.

SHARLIE, 5 yrs.
Milk tests 6 per cent.

VILLA, 12 yrs.
Milk tests 6.6 per cent.

CORA, 9 yrs.
40 lbs. per day of 5% milk for 3 mos.

FLORENCE, 5 yrs.
Milk tests 5.2 per cent.

PART OF DAIRY HERD OF R. W. ELLIS, EMBDEN.

who have money to burn. I am here in behalf of the common farmer of to-day, and when I am at home I am right at the toil, in the stable or in the poultry department, actually at work every day with the men that are in my employ. It is no disgrace to be in debt, but it is a disgrace to carry that indebtedness without making an effort to pay it. In the old way we could not pay our interest, but in the new way we lifted that indebtedness. And five years ago I bought my brother's interest in the first farm that we two had, and he has moved six miles away onto another farm. You see it requires stick-to-itiveness. In the old way we never could have lifted that indebtedness, with real estate constantly diminishing in value and the products of the soil bringing less and less and less. I tell you, life is a battle, and the glory is in the victory; and I thank God there is dignity in labor. Labor develops all the good there is in man; idleness all the evil. Right here in the State of Maine, with plenty of nutritious grasses, and where the elements of the soil contain all the material to grow the soundest bone, the strongest muscle, milk of the best quality and butter that tickles the palate, and upon every plain you have planted a city and upon every hillside is nestled a village, and with the mighty increase of population which calls for more milk and more butter, this little State ought and could and should be the breeding center of the world. And you, fathers, give your sons the right hand of fellowship. Encourage them in this good work, for the products of the dairy are food for angels. In the early ages, on a certain occasion, Abraham entertained three angels, and he put before them butter and milk. The enterprise is ancient, and thank God it is honorable. God has guaranteed to bless the tiller of the soil if he tills it intelligently. Let us take God at his word, and read and think and act accordingly, and God will bless us financially.

Fathers, I want you to so care for the little ones of your flocks that ere long your farms may be covered with large herds of cattle feeding upon the hillsides and grazing in your valleys, that your barns may be filled with plenty, your storehouses overflowing with milk and butter, and that you may be blessed in basket and in store and the children gathered around your hearthstones and playing upon your green lawns may in the years to come rise up and thank God that their ancestry did exist.

Ques. Do you allow the calf to suck?

Ans. The calf is put away, because there is the motherly instinct, and if the calf sucks the cow she will have a love for the calf so that when it is put away she will mourn, and it causes a dwarf in the milk flow. For that reason we never allow the calf to suck the cow. In Holland, you know, the calves are never fed except with a pail, and their instinct is to turn their noses down instead of sticking them up. We have some thoroughbred Jerseys, as we have a boy that is passionately fond of Jerseys. His calves, when he feeds them, will turn their noses up, and he will slap their faces and become disgusted; but when he feeds the Holstein calves they turn their noses down. It has become thoroughly bred into them, while the other breeds, as a rule, turn their noses up. If you feed a calf but four weeks take the calf away, or the cow does not do so well during the whole summer.

Ques. Is it not true that you can take a calf right away from the cow and give it sweet skim-milk at regular intervals, in moderate quantities, and raise the very best kind of a dairy cow?

Ans. You are right. I will tell you the way we do. We feed new milk until the calf is four weeks old, then skim-milk and a little linseed meal, and when large enough to eat oats we feed them, and a plenty of clover hay, and in the winter some ensilage. It is very essential that we should feed blood and muscle and bone producing foods instead of heat producing foods. Corn meal you should avoid, and anything of that description. Oats and peas are nice, and wheat bran and buckwheat middlings.

Ques. How long do you feed skim-milk to a calf?

Ans. That depends on what we are raising it for. If we are forcing it and wish to make it as attractive as possible we feed the milk longer and in larger quantities. When we were putting the animals on sale all over the United States we watched their digestive powers and fed accordingly, and I think that controls the whole business. If you want to grow a calf fast, watch its digestion and give it all it will bear. Weigh the milk and constantly increase it, and it will take more and more. For twelve years we weighed every bit of our milk, morning and night, and had official tests of each one of our cows, and when the calves were born we fed them all they would take and watched their digestion, and we have grown calves 100 pounds a month. You can feed moderately with oats and wheat bran. It requires a great deal of judgment to be a good feeder or a good breeder.

Ques. Do you feed grain continuously?

Ans. We feed grain to calves born in March or April during the first summer. The next year we turn them out. If they are born in the fall we feed them during the winter and then turn them out. Take a calf that is born in March or April and turn it out among the flies, and it has so much to disgust it and has to wiggle its tail so much that its growth is stopped. We make them as comfortable as we possibly can.

Ques. You spoke of the escutcheon, what value do you place upon it?

Ans. People get confused when they study escutcheons, and for that reason I put a great deal of stress on the escutcheon. One thing I want you to notice is this: Where the hair is thrown up on the thigh it indicates milk force and persistency. And if the escutcheon is filled with yellow dandruff and is soft and mealy, that indicates quality.

Ques. Do you really place, in the selection of cows, a very high value upon the escutcheon?

Ans. No, I do not put any particular stress upon it except privately, but all those rules go hand in hand. When I was at Toronto I saw 112 Holsteins, and I notice that the escutcheons are better developed on that breed than they are on many of the other breeds. In the Holstein breeds more attention has been paid to the escutcheon. You will notice that in the case of large milkers, as a rule, the hair is thrown up over the thigh, and where there is not force enough to throw up that hair the chances are that the animal is not so heavy a milker.

Mr. Adams. The best cow that I ever owned had no escutcheon. Of course that does not prove anything. If we should find a great number of large producers without any escutcheon that would be of more importance. In the West, we do not feel that the escutcheon has a large value, with Jersey cattle.

Ques. How long would you let cows go dry?

Ans. That depends upon the cow. Some cows are so persistent that you cannot get them dry at all. We have fed them on straw for the purpose of drying them off, and when their next calves were dropped their quarters were gone. If you have a cow that is very persistent, encourage the persistence by good feed and keep her in constitutional vigor. We had a cow that was not dry for eight years. But I would rather have a cow dry six weeks or two months than not dry at all, because it gives her a rest and her offspring is stronger.

J. M. WINSLOW.

I feel that it will be entirely wrong for me to occupy very much of your time, after listening to this very interesting lecture, but there are a few thoughts which I think it will be well for us to carry home with us, and perhaps to discuss for a few moments. We have not all, of course, the best cows; that we realize. And I think we have not all good cows, and we have been told by the speaker what to do to get better ones. We have such cows as we have, and the season is before us now when we shall have to feed them for the next five months, and I think one point that we should look at and carry home with us is the more intelligent feeding of our farm animals. I am well aware that there are many farmers feeding stock this winter carelessly, without any forethought, simply giving them, as they say, all they will eat. I was in a barn not long since where a man had some blooded stock which he had recently purchased, and he wanted to do the best he could. He had a fine Durham heifer three years old that looked hungry; her hair was pointing towards her horns, and there was good English hay away out under her fore feet, in the middle of the forenoon. There was probably hay in her crib all of the time. We would not feel like eating dinner if we had sat at the table with a plate of food before us all the forenoon and kept tasting it. I am aware that in my own part of the state there is great carelessness in the matter of feeding. Farmers think they are doing right if they give the cattle all they will eat, and more. But they are destroying their appetites, and consequently they look hungry. If a man feeds his cattle intelligently and according to the best authority, they will look sleek, their hair will be smooth, and when they are fed their meals they will have an appetite for them, and will eat the food up clean, and the careful feeder sees to it that they do not go hungry. I think that this is one of the most valuable points that we should take home with us. Certainly we shall remember the lecture we have just listened to, and we know how to start to improve our herds.

Hon. H. C. ADAMS.

I am very glad of an opportunity to say a word at this time, because I want to commend the address to which we have just listened. If there is anything on earth that does my soul good it is to hear a man talk as our friend from New York talked this morning. He talks good dairy sense. He has made a study of the dairy cow, and he has got as much energy himself as any dairy cow that I ever saw. I think that Governor Hoard would pick him out as a representative of the dairy type, of the nervous temperament. And he has something else, he has conviction and he has courage, and he does not hesitate to come to the farmers of Maine bringing with him not only wide but profound knowledge of that wonderful machine, the dairy cow. He has not only knowledge of the business which is needed to be carried on with that cow to make it pay in better farms, better homes and more comforts, but he has the courage and the sense and the logic to drive it right down into your hearts. These meetings are held not simply for the purpose of having a good time, not simply for the purpose of spending the money of the State, not simply to have a social reunion; but if they are held for any purpose over and above all other purposes, it is to make the men who till the soil in this State know more about their business, think more about their business; that they may come here and get things which are of practical use to them and go back home better educated, better satisfied with their business, better husbands, better fathers and better citizens of the State.

I want to say to you that my whole life and my whole interests have been bound up in this business of tilling the soil. It is a good business if we follow it well, and if we do not follow it well it is the hardest tread-mill upon earth. You see men in your communities, in New York, in New England, and in Wisconsin, living side by side on farms of equal value, both of them working hard, one man making money and the other losing money. I tell you the average American farmer has greater possibilities in him than he knows. There is not one farmer in 100 but that, if he will exercise his will and the power that lies in him, can grow within twelve months intellectually in a way that would astonish him if he could realize it. And this whole work of education that is carried on by your Dairymen's Association, by the State Board of Agriculture, by all these organizations designed for the uplifting of the farmer, means practical things,—more comfort and more wealth to your State.

If I had time I would like to reinforce, and emphasize, if it is possible to emphasize, the statement which the gentleman has made about the dairy cow. She is the machine; do not waste any time upon a machine that rattles, or is not oiled, that you cannot do business with. As I said at an institute the other day, the average farmer in Wisconsin, in Maine, and everywhere, when he goes out to plow wants a plow that will cleave. He will not plow with a plow that will not cleave. But that same farmer will take a cow that does not earn enough to pay for her salt and will raise a calf and will keep them both when they are constantly getting him into debt. One farmer says, "I have a lot of cows. I suspect some of them are poor ones; I am willing to do better, but what shall I do?" Do this: test your cows. Keep those that test high enough to be a paying investment, and if you can afford it, sell the rest of them. If you cannot afford it, or think you cannot, then get a good sire, as my friend says, and breed up some better stock. Just one word in relation to the sire. Do not think for an instant that breed puts a patent of nobility upon all the animals that are registered, but it is an indication of merit. Individuality counts, and the sire, as I believe, transmits more of the good qualities to his product than the dam, and you want to see to it that the sire has behind him a good mother, and a good grandmother. The calf owes more to the grandmother of the sire than to any of the cow's ancestors.

So sift out your cows, keep those that pay and get rid of the others or breed them up, and then take care of them. Do not let any man talk to you this nonsense about getting a dairy cow that is hardy. You cannot get any such cow; she does not live and if she did she ought to be killed. It is not the business of the dairy cow to be hardy. The original cow, wandering upon the plains, had big horns, big bones, lots of hair and lots of muscle, and the cows that had the strongest bones and the strongest muscles and the most hair got away from the most enemies, and kept growing stronger in bones and muscle and horns and hair year by year. They did not give very much milk, but those cows were hardy. But man came in and began to take off some of the hair and get rid of some of the bones, and draw the blood into the digestive machinery, and the cow became an animal of greater power but she could not endure weather. It was not her business to endure weather, it was her business to elaborate milk, and that takes a tremendous lot of energy and force, and we want to save all that energy and force by putting that cow into a clean barn, cleaning her off, giving her warm water, giving her large amounts of easily digested food, making her an artificial creature. She is an artificial creature, she cannot help it; we have made her so, and the more artificial she is and the less capacity she has to stand the rigors of a cold winter by the side of a cold straw stack, the better she is for our business. It is purely a question of dollars and cents. My friend and I are allied to this dairy cow that he has talked about because she brings us money. She is a beautiful animal. We can love her for her beauty, and love her for the comforts that she brings, but over and above all things she is an animal that makes money and lifts mortgages and brings comfort to the home.

I want to say to you here in Maine, stand together for things which are right. Never ask anything, as farmers, which is not right, and when you ask that which is right throw aside your personal differences, throw aside your personal ambitions; let no jealousy creep in between the various agricultural organizations of the State. Go to your legislature in a solid body, and when you have men there representing you see to it that they know that you appreciate their friendship. Send men to the legislature not simply because they are farmers, although it is a right thing to send farmers there, but send men to the legislature who are men, and who will stand up and recognize the interests of the farming population of this State. It does not give any man a title to a seat in the legislature because he was born, or raised, or has lived upon a farm, but it does give a man a title to a seat in the legislature if he is so made that no corrupt influences will touch him; that he is broad enough to love his State with all its splendid interests; that he will regard the interests of the farming population and do them justice in the halls of legislation. We want not simply lawyers, not simply farmers, nor simply business men in the state and national legislature, but we want *men,* men well rounded and loyal to those principles of right and justice which on this American continent have had their home and their cradle in old New England.

THE GRADING UP OF A BUTTER-MAKING HERD.

By Valancey E. Fuller.

The Rev. T. Currie says: "There is nothing aside from the milk of human kindness so necessary to the comfort of any family as the milk of a good cow. It is like oil poured upon the waters of life; it is a perfect food for the baby; it is an excellent beverage for the children; it furnishes cream for the coffee, butter for the bread and cheese for the lunch. It shortens the pie crust and raises the Johnnycake; even the cat and the dog cry for it. With the farmer it goes still further. It raises the calf; it feeds the pig; it pleases the colt and it delights the chicken. Yes, and if he will only give her a fair chance, the cow will clothe the children, buy comforts for the wife, pay the taxes and help lift the mortgage." This is about as concise a statement of the value of the cow as I have ever seen.

In order to grade up a profitable butter-making herd, the first essential is to possess cows that will produce in a year the greatest quantity of butter at the least cost; not the ones that will produce the most butter, regardless of cost, but the ones that make the greatest net profit. Such a cow is of necessity a "profitable dairy cow."

It has been often said that a profitable dairy cow is "born,—not made." It is true, you cannot make a poor milker a heavy one, or a cow that gives thin milk, produce milk rich in butter-fat; but you can increase, by proper care and feeding, the natural tendency to give a large quantity of milk, and so fix the characteristic in her, that it will (by judicious coupling and proper raising of the calf for the purpose for which it is to be used) become hereditary in her descendants, and be transmitted through generations with almost unerring regularity. On the other hand, improper care and feeding will cause the good cow to deteriorate, and if persisted in for two or three generations, will utterly destroy the natural propensity for deep milking.

CAREFUL SELECTION.

Some beginners will buy an entirely new herd; but they are largely in the minority. Most will seek to retain the cows they now have, as a basis on which to grade up the herd. This is usually accomplished by weeding out the unprofitable cows, and keeping the most profitable; then by the use of a pure bred bull, of a breed especially adapted to butter-making, seek to make each generation better than the preceding one.

But this must not be done by any guess work, nor must favoritism be shown in making the selection. A record of the milk of each cow should be kept for a year, and by taking Babcock tests of the butter-fat, the amount of butter each cow has contributed in the year ascertained. I am aware that weighing the milk and taking a Babcock test but once a week is not absolutely accurate; but it is sufficiently so for all practical purposes. You will be surprised to find in a short while, how little time it takes each day, and the results will pay you well. Many a surprise will be in store for you, as to the paying qualities of the respective cows.

Have no hesitation in discarding those cows that are not paying you well. They have mistaken their mission in life. Let the butcher have them. They may be good for him,—they certainly are not wanted by you. Retain only the good ones as the foundation of a herd.

Many dairymen are so situated that they must keep up their herd to a given production to take care of their trade, and will require to replace those discarded, by purchasing others.

While I know that the only infallible rule by which to judge the merits of a dairy cow is the scale and the Babcock test, or the churn, there are some rules in judging a dairy cow, which, if adhered to, may assist in the selection of the better ones.

One of the most important elements is continuity in milk. We all know that the cow which at flush will give you a large flow of milk, will not, in the course of a year, always give as much as one which at flush gives a less quantity, but "hangs to it" close up to calving. Apart from the lack of proper care and feeding, I know of nothing that causes more loss to the dairyman than keeping cows which, when they have been in calf for three to four months, begin to shrink rapidly in their milk. Such a cow has no place in the dairy. The food that ought to make milk is utilized by her to put fat on her back. She may be pleasing to the eye, but she is disastrous to the pocket.

In judging dairy cows, I have more often been deceived as to the quantity of milk a cow ought to give at flush, than I have been in judging of her "tenacity" in milking. In fact, I have rarely failed as to the latter.

JUDGING THE DAIRY COW.

See that her jaw be large and strong; that she has good lung and heart capacity; that her neck be long and thin; that her withers be not fat, but rather sharp, and that she gradually widens out from her withers along her ribs, until you notice her bread-basket, which should be very large and deep, and near the ground; that her ribs be open,—not rounded like the beef animal's but firm and able to resist the pressure on them; that her loins be broad and her hips high; that her thighs be flat, with plenty of open space for the bag. Judged as a whole, she should present a decided wedge shape. Such a cow will not put any flesh on her back, when in milk,—she is not built that way. She is a dairy-built cow in continuity in milk, and is not a beef animal. If, in addition, she has a large and not fleshy udder, in which to hold the milk; if her milk veins are large, tortuous and elastic to the touch, and spring back rapidly when compressed between the thumb and first finger; and if her milk holes are large, then she bears all the indications of a deep and continuous milker. Do not be misled into judging the constitution of a cow by her rounded ribs, and her general sleek appearance, with rounded thighs. Flee from her. She is none of your kind, if you are in the dairy business. Pass her on to the butcher. Bear in mind that the size of the milk veins will be largely affected by her age. If old, her veins are large but not firm. A small, firm milk vein is usually a better indication of a large milker than a large and sluggish one.

Of course I must not be understood to indicate that a large flow and continuity of milk do not go together. They often do; and happy is the man who owns such cows. But if it is a choice between the two characteristics, when both are not present in one cow, choose the continuous milker, every time. Follow closely the directions I have given, for judging her, and you will rarely make a mistake.

THE BULL TO BE USED

to grade up should be a pure bred one of the breeds well recognized for their profit in butter-making. It is generally conceded by the public that the Jerseys and Guernseys are pre-eminently the best for that purpose; and though both have their friends and advocates, judging by popularity, the Jersey takes the first place. The bull must be selected with care, and with a knowledge of his ancestry. If you do not know their qualities, make inquiries from the breeder. Breeders of live stock are, as a rule, honorable men, and will furnish you with correct data. Insist on getting a registered bull; but do not be satisfied to use a bull, simply because he is registered, which is merely a guarantee of the purity of his breeding, but is no evidence of the qualities of his ancestors. There are good and bad of every breed, and degrees of both.

Never use a grade bull. The object sought in using the bull is to impregnate your herd with the qualities for which his breed and his ancestors are noted, and thereby improve your stock. If he has any impure blood, his get may revert to that "cold blood." We know how a pure-bred bull will improve the outward semblance of his breed, on even the first cross. The reason is that the native stock is usually of mixed breeding. The blood of the pure bull has been handed down to him, for many generations, pure and untainted, and hence is the stronger or more prepotent of the two. Each cross of a pure-bred bull ought to improve over the dam. Once having used a pure-bred bull, follow his use by another of the same breed. Do not change from one breed to another, or you will lose the beneficial results already attained.

In the selection of a bull, we must remember that "like begets like or the likeness of an ancestor;" and in my experience, it is more often the likeness (qualities) of a remote ancestor, rather than the immediate progenitor.

See that the dam of the bull has the characteristics in milk giving and butter making, in form and size of udder, milk veins and teats, you desire to see perpetuated in your herd; and that his female ancestors for four generations (where it is possible to ascertain) were possessed of like characteristics. Then you may be reasonably assured that the bull will, when coupled with desirable dams, maintained to their full measure of capacity, produce satisfactory offspring.

THE CONFORMATION OF THE DAIRY BULL

should be the reverse of the beef type. His head should be clean, with a good, large, prominent, placid eye; his neck long and fairly thin over the front shoulder; he should have good constitution, large stowage capacity and short legs. Do not object to him on account of his hip-bones being high, and his thighs flat; but avoid him if he is very heavy over the front shoulder, if he is beefy and his thighs are fat. See that his thighs are well cut out behind, so that were he a cow, there would be space for the udder; that his rudimentaries are long and well placed; in fact, that he is constructed on as close lines to the dairy cow as is possible, regard being had to his masculinity. If a bull possesses these characteristics, and is descended from desirable ancestry, you may be pretty well assured he will get you good dairy cows.

FEEDING FOR PROFIT.

In my judgment, there is no part of dairy farming which calls for so close attention, good judgment and management as feeding the dairy herd. No rule can be laid down for feeding a herd that will prove infallibly applicable to individual cows, under all conditions, and in all localities. The individuality and digestive capacity of cows differ so much, that it is impossible to lay down any fixed rule to suit each. It may be truly said that to obtain the most profitable production from a herd, we must study and learn to know the wants and the digestive capacity of each cow.

In feeding, we must not seek to force a cow to her utmost capacity, regardless of the cost of feed, or injury to the animal; but rather to so form our rations that the cow will make milk or butter at the lowest cost, so as to produce the greatest net profit. No economic ration can be compounded that will, in cost, suit each section of this vast country; that must be regulated, to a great extent, by the cost of the different feeds in the particular locality where the herd is maintained. For instance, in the corn belt, corn, and in the cotton belt, the products of cottonseed, are the cheapest foods. But they must always be fed in conjunction with other foods, rich in protein. Much has been written and said as to a "balanced ration," and rules for feeding same have been laid down, based on the live weight of the animal to be fed. Valuable as they are, they can be accepted only as a guide, not being applicable to each individual case. While it is true as a rule, that "cows consume food in proportion to their weight," it is not always so. I have fed many large Jerseys that ate far less, and produced far less than smaller cows. I would rather state this as an axiom: "A profitable dairy cow consumes food in proportion to her producing power at the pail and churn."

Consumption of feed, and making returns therefrom, is a matter of education. Any breed of dairy cows that has for generations been fed to the limit of profitable production, has had fixed in it (so that it is hereditary) the power to assimilate and make returns at the pail and churn of a larger quantity of feed than another breed of even larger frame. If the dairy cow makes return through her udder rather than by putting it on her back, for the liberal feeding that we give her, such feeding will not increase the size of her carcass. If we persist in feeding dairy cows liberally, for several generations, it will be found that in structural form the descendants will have acquired large digestive apparatus, and will take care of and make returns for a far more liberal diet, than a cow not so descended. The former will digest it, and make good use for it; the latter will become "stalled" by it. What will be a profitable feed to the former will be wasteful to the latter, as it will be overfeeding her, and she will not assimilate it.

In my experience, the most profitable dairy cow is the one that will perfectly assimilate the greatest quantity of feed, and make an increased return for it; or, in other words, is a good feeder. Liberal feeders are the successful dairymen, provided they do not carry it to the extent of waste.

Study your cows closely. Watch their feed box to see that they clean up their feed thoroughly, and are keen at the next feeding. Watch their droppings to see that no food passes through them undigested. Watch results closely, in conjunction with any new feeding you may try. Never make too radical changes in the character of feed. Treat your cows kindly; feed them regularly; milk them at a fixed time each day, and, if possible, always have the same person milk the same cow.

There is one principle, however, which may be laid down, applicable to all dairy cows, and that is, that if the best production a cow is capable of accomplishing is to be obtained, you must from the first thirty to forty-five days after calving, procure her largest possible flow of milk. Experience has taught me this, and the result of handling the herd of Jerseys in the World's Fair Dairy Tests, where each step and its causes and effects were marked with the most careful attention, further emphasizes this fact. Whether the cow be kept for the production of milk alone, or for the making of butter and cheese, it is equally important that we get the highest production of milk in the first thirty to forty-five days after calving, regardless of quantity of butter-fat contained in the milk. If you are keeping her for butter making, and if she is a cow of a breed whose habit it is to produce butter-fat, when she begins to shrink in her flow, her milk will be enriched proportionately. Unless you bring the cow to her highest production within that time, her total production until next calving will be materially decreased.

If we have been fortunate enough to procure from her the best yield in that time, with careful handling and feeding we can retain her, as a rule, upon a good flow for a considerable time; but once permit the cow, in her earlier period of lactation, to be without the necessary food and care for the production of a good flow of milk, and you have lost her best services, until the next calving.

With the object in view I am advocating, it is very desirable to stimulate the cow to a large flow of milk by feed such as will tend to that end. Do not give her what is commonly called "rich feed." Make the food rather "sloppy," in the earlier period of lactation, and make every effort to increase her flow. Every check or "set-back" at this time, has a lasting effect.

I dislike to see a cow come too rapidly to her milk after calving. I prefer to see her gain gradually, in proportion to the increase of feed. My practice has been to give the freshly calved cow about two pounds of bran, two pounds of ground oats, and a half pound of linseed oil meal (old process) for the first six to eight days, as a mash, using hot water, dividing it into three feeds; to give her all the warm water she will drink; if she will not drink the warm water, add part of the mash to it. For the first six to eight days, treat her as a sick cow, and nurse her.

If, at the end of that time, she is doing well, increase her bran and ground oats by one-half pound per day, until she has three and one-half pounds of bran, three and one-half pounds of ground oats, and one pound of linseed-oil meal, which she ought to take about the 15th day after calving. Feed this quantity from about the 15th to the 20th day after calving. When she is taking care of this, give her plenty of bulky food,—cut clover, cornstalks, green feed or ensilage. At the end of the 25th day after calving, increase the bran and oats, and from the 30th day after calving add corn meal, if she is used to it, and it produces good results.

The main feature to be observed is, never increase your feed by more than one-half pound per day. Increase at that rate, for three to four days; then rest the cow for a like period, in order that her digestive organs may become used to taking care of this. Then you can go on safely and increase her feed, but never more than one-half pound per day. If you find, at any time, under this treatment, that your cow decreases her flow, rather than increases it, you may feel pretty well assured you are overfeeding her; therefore cut down her feed, until she again responds to it. When she has been in milk thirty to forty-five days, according to the individuality of the cow, add a little more corn meal and cottonseed meal, and gradually increase it, if you are seeking butter, until you have brought your cow to her best production in butter. Experience of the individual cow must be your guide as to how fast you can increase her feed, and the composition thereof.

FOOD FOR DAIRY COWS.

Corn.—Indian corn, when ground, is a most valuable food; and in most localities it is one of the cheapest that can be used by the dairyman in the Indian corn belt. It gives a good grain to the butter, and a good color to the milk. It is a very heating food, and must be fed in conjunction with such food as bran or oats. Feeding cows on it for an extended time, unless it is balanced as before intimated, tends to put fat on the carcass.

SILAGE.

I know of nothing that has so greatly aided the dairyman as the silo, provided he cuts and stores his corn at the proper time. The corn should be allowed to stand until the kernels are just beginning to glaze. Do not cut it too early, as it will then make what is known as a "sour ensilage," and its feeding value will be greatly lessened by its containing too much water and not enough "food matter." If cut and stored as indicated, it ought to contain from twenty-five to thirty pounds of food matter in every 100 pounds. Do not permit your corn to become too ripe, for fear of its fire-fanging. The Vermont Experiment Station, by a series of very carefully conducted experiments, proved that silage is the most profitable form in which corn can be fed.

We all know that our cows require succulent foods. Good pasture is the ideal food for the dairy cow; but in the greater part of the country it is not available for more than a few months. Roots are not grown in the United States; at least not to the extent to supply our cows with them. In silage we have a food that will supply the necessary "green feed" for months. It stimulates the cow's digestion, and is not only good in itself, but aids in assimilating and digesting the grain that is fed. I have no faith in the claim made that ensilage gives an undesirable flavor to the milk, cream or butter; certainly not if fed after milking. I believe, however, from my practical experience in shipping milk, that ensilage-fed milk has a tendency to "go sour" quicker than when no ensilage is fed. But even if that be true, the benefits to be derived from it, in the economy of the feed, and in the increased production, far more than offset any disadvantages.

ROOTS.

I have had a great deal of experience in feeding roots; and though they entail a great deal of labor in the raising of them, such labor is beneficial to the land. Yet much as I was pleased with the result of feeding them, they cannot be compared in economy to ensilage. Like it, they are very appetizing, and supply a juicy and succulent food. They do not contain anything like the digestible dry matter (the basis on which food is valued) that properly ripened and cured ensilage does. If the dairyman, however, wishes to produce a highly colored milk in winter, he should feed carrots. The best way to feed roots is to slice or pulp them, mix with cut hay, then sprinkle "meal" over this, mixing all together.

OATS.

In my experience, there is no food that can be fed to dairy cows so continuously, with beneficial results, as oats. They have no tendency to "put on fat." The cow rarely tires of them. They give a delicious flavor to the milk, and an aroma to the butter. They are a greater producer of milk than is corn, and are not so heating, containing more protein. Professor Henry, director of the Wisconsin Agricultural Experimental Station, says: "At the station, we have found oats to have a virtue about ten per cent. in excess of an equal amount of bran for producing milk and butter-fat." The question of their use must, of course, be regulated by their cost to the user.

COTTONSEED.

This is very largely fed in all its forms, by the stock growers and dairymen of the South; and for them it is the cheapest feed. The cottonseed is often boiled in the South, and if too much of it is not fed, good results follow its use. Cottonseed meal I have found a very desirable feed. When not used to extremes, it is both a milk and butter-fat maker; but to cows weighing 800 to 900 pounds, I would not care to feed more than two to two and one-half pounds a day. Fed in this quantity, it has a beneficial effect on the butter, in hardening it. If you feed too much, it has an injurious effect on the cow (as it is very rich and heating), and also on the butter.

LINSEED MEAL.

Use the "old process" linseed meal, in preference to the "new process," as the former contains more oil than the latter. Linseed meal, if fed in reason, is a most excellent dairy food. It is beneficial to the bowels, and is not so heating as cottonseed meal. If too much is fed, it softens the butter, and causes the cow to scour. Two or three pounds a day is enough to feed to a cow in full flow of milk.

BREWER'S GRAINS AND MALT SPROUTS.

These, when dry, may, from the usually cheap price at which they can be bought, be profitably fed to dairy cows. When wet, I would advise leaving them severely alone; as unless great care is taken in washing out the manger, or feed boxes, after feeding, they become foul, and are dangerous to the health of the cow.

GLUTEN MEAL.

My experience with this feed is limited, and not altogether satisfactory; but I know that in the New England States large quantities of it are fed, and I am told, with good results. I believe, however, that while it may from an economical standpoint, be desirable to feed it, it should be done carefully.

BRAN.

This will always remain the staple feed for dairy cows, when mixed with corn, cottonseed meal or linseed meal. It is cooling, acts upon the bowels, and is beneficial in every way. Its continuous use is more fattening than oats; but it should always form a part of the dairy ration, and is the safest food that can be given.

SHORTS AND MIDDLINGS.

Under the changes that have taken place in milling, the shorts or middlings are little better than bran. If bought from the old "stone mills," they are richer in starch than bran, but cannot be fed in such large quantities, as they tend to "impaction."

PEAS

are a very "rich" feed, and should be fed in limited quantities. So fed, they form an excellent food.

BARLEY

is much used on the Pacific coast. I once bought, at a low cost, a quantity of barley, and fed it to my cows, with the best results. It is a milk maker.

OATS AND PEAS COMBINED.

This is very digestible, is greedily eaten by the cattle, and assists in keeping up the flow of milk. They should be cut when the oats are headed out, and not be allowed to get too old. To ensure a succession of this crop, we must sow at intervals of from ten to fourteen days.

CLOVER HAY

is an essential accessory to dairy farming. Timothy hay should have no place in the dairy barn, except it be in close proximity to the horse barn, and the timothy is intended for the horses. Clover hay, which should be cut in its early bloom, should be fed liberally, and a dairy farmer should never be without it. When cut early it is far more digestible, and is much more relished by the cows.

CORN FODDER

or "corn stover," as it is sometimes called, is a most valuable food, if the corn is cut at the right time, and properly stored. It is generally considered that it has reached its highest yield in corn, and greatest feeding value, when the ear has become well dented, and the blades have begun to dry. If left too long before cutting, the corn-fodder loses largely of the dry matter and feeding value. If cut at the right time, and put in large shocks, if it be not wet with rain or dew, there is no danger of spoiling. Under ordinary circumstances, it will take about six weeks to cure; and the sooner it is put in the barn, after that, the better.

It is generally believed that the best way to deal with corn-fodder, is to shred it. Objection to this is raised by some farmers, that it heats after shredding, when placed in bins or mow. In shredding, all the stalks as well as leaves, should be torn into fine pieces.

When so treated, and fed with some meal, it is a very economical assistance in the dairy barn; and it is greatly to be regretted that so much valuable corn-fodder is left in the fields to go to waste.

Many have found that when the fodder is put through the ordinary feed cutter, it leaves hard chunks, which, having rough edges, injure the mouth of the cow, and inflame its intestines. All are not so situated that they can follow the practice I did when feeding corn-fodder. My custom was to "cut up" enough corn-fodder on a wet day to last for five to seven days, cutting it about an inch long. I had a box twelve feet long, four feet broad, and three feet deep. Into this box I introduced steam pipes from my boiler, running along the bottom. We placed a layer of cut corn stalks on the bottom, then a layer of bran, another of cut corn stalks, and on top of that a smaller quantity of middlings than we had of bran, and so on alternately. We turned the steam on for about an hour at night, and allowed the mixture to remain in the box all night. On opening the box in the morning, we found the stalks softened, oily to the touch, and all, including the bran and shorts, in good condition for assimilation. We mixed the whole contents well together, and fed it to our cows. It was much relished by them, and was a good milk producer.

FEEDING GRAINS, WHEN ON PASTURE.

It is generally known to those familiar with my writings or "talks," that I am an advocate of liberal feeding, and have great faith in the benefits accruing therefrom. I know there are a great many dairymen who believe that to feed a cow any grain when she is on good pasture, is a great mistake. Unless bran and corn meal be very high, it will be found profitable to feed a mixture of these, but in small quantities. As the pasture begins to fail, the grain should be increased, and the pasturage supplemented by "green fodder," or failing that, by ensilage. Cattle, however, like variety; and for that reason it is preferable to feed "green fodder" in summer, and keep the ensilage for winter feeding.

PROPORTION OF GRAIN TO COARSE FODDER.

As I have before stated, no rule for feeding can be laid down, that will apply to each cow, alike; and yet the success of the herd depends on procuring the best production, at the least cost, from each cow. I have also urged that cows be fed to their full capacity, to obtain the most profitable results; but there is just as great a necessity not to overfeed, as there is not to underfeed our cows. Care must be exercised that we do not feed so much grain that there is, so to speak, no room left for coarse fodder. The latter is absolutely necessary, to maintain the cow in health, and not tend toward fat. It is a pretty safe rule to follow that a cow should always be fed twice as much coarse fodder as grain. If a cow will eat, say eight pounds of grain and sixteen pounds of coarse fodder, or twelve pounds of grain and twenty-four pounds of coarse fodder, there is little fear of "stalling" her. We cannot, however, estimate ensilage by weight, in making this calculation, as it is generally conceded that three pounds of ensilage should be counted only as one pound.

THE SEASON TO CALVE DOWN COWS

must be regulated largely by the business the dairyman is engaged in. If it is the making of butter, the prices are, as a rule, higher in winter than in summer. If supplying milk, while a good supply is always necessary, less is consumed in the large cities, and more at the watering places, in summer. So far as the year's production by the cow is concerned, she will give more milk, if calved down in the fall. Being fresh at that time, and being fed ensilage with grain feed to keep up her flow of milk through the winter, we would naturally look for a diminution of milk in the spring; but turning her out to grass at this time, her flow is given a fresh impetus. You can then have her dry in the dog days. If, on the contrary, the cow calves in the spring, about the time her flow begins to diminish, she has scanty pasture; and you bring her into her winter quarters, so shrunk in her milk, that it will be expensive work to induce as large a production as is desirable. Again, the milk in winter is richer in butter-fat than that produced in summer; and it is the solids the milk contains, not alone its quantity, that makes it valuable for butter, cheese or human consumption.

GOOD WATER AND PLENTY OF IT,

untainted by any manure heap, barnyard or any other source, must be given to the cows. They must have access to it, so that they can drink their fill, whether it be in the manger, in the stable or in a trough, or by any other means. I have never known a case where a cow, having the water carried to it, by a bucket, got enough. The carrier becomes tired sooner than the cow, every time. Cows in milk consume about fifty per cent more than dry cows. It was found, by careful experiment at one of the experimental stations, that more than five pounds of water were consumed, to every pound of milk produced.

SALTING COWS.

Cows must have plenty of salt, to keep them in good health. Barrel salt is preferred to rock salt.

It is always desirable to breed our own cows on the farm. If, however, we expect to have the heifers mature into better cows than the dams, these essentials are requisite: First, that the sire be a most desirable one; and second, that we grow our heifers with the one desire of fulfilling the same functions as the dams, though in a greater degree, viz.: the production of the greatest net profit at the least cost.

It has, I hope, been proved that the feeding of the dairy cow differs radically from that of the beef cow. I have claimed that the more the cow can profitably consume and make return for, the more valuable she is,—and the ability to profitably take care of a great quantity of food is largely a matter of training.

The same rules that apply to the feeding of cows, should be borne in mind in raising calves and heifers. The calf or heifer should never form the habit of taking on fat, but all our efforts should be to have them make a steady growth, to give them plenty of bone and muscle, and a great, big paunch,—the bigger the better.

The practical dairyman and breeder knows that if he feeds his heifer heavily with grains, especially the fat-producing ones, when she comes in milk, and he begins to "gain her," as he ought, in place of responding to such feed by way of the pail, it will go onto her back, because she has formed that habit previous to maturity, and she will never prove a profitable dairy cow. If, on the contrary, she has been kept growing steadily, and has formed bone and muscle, rather than fat, the stimulus of the feed to the giving of milk will be responded to.

I will now give some hints as to the

REARING OF CALVES AND HEIFERS.

As soon as the calf is dropped, allow the mother to lick it. If she does not do so of her own accord, that end is often obtained by sprinkling salt on its back. Some breeders leave the calf with the cow for one to three days; others take the calf away, but let it suck the cow for about three days. I believe it is desirable to leave the calf with the cow, at least three days, as she will fret less than if the calf is taken away from her at once. At the end of three days, as a rule, all danger of milk fever is past. Again, inflammation is often drawn out of the udder by the calf sucking. Whichever course is adopted, it is important to watch that the calf does not drink too much milk, as it will cause "scouring" in the calf.

As you cannot, of course, measure or weigh the milk the calf takes from the udder, it is a safe plan to stop the calf from sucking as soon as the belly is distended. Then the cow must be stripped. Let the calf have its mother's milk for the first eight days. In case the mother is a Jersey or a Guernsey, the whole milk often proves too rich for the calf; and it is a safe plan to add about one-sixth hot water (of 96° Fahrenheit) with a little slackened lime about the size of a small marble added to it. Care must be exercised to see that the milk, when fed, and the water, when added, are of a uniform warmth of from 96 to 98 degrees F.

When the calf is from fifteen to twenty days old, it will often nibble a little clover hay, which should be tied in the calf's pen, with the heads down, or placed in a small manger or crib, where the calf will have access to it. When twenty-one days old, besides the clover hay, it may be fed a little whole oats or a little bran. The former is far preferable. Feed this to the calf until it is four months old, increasing the skim-milk slightly, and giving it all it wants of whole oats or bran. Salt should be sprinkled on the grain feed, and the calf should have access to clean, pure water. After the calf is four months old, you can permit it to eat grass, or feed it ensilage in limited quantities; keeping it still to the oats, bran and milk feed, until it is eight months old. Never feed it corn meal or timothy hay in that time.

I need hardly say that the calf stable, all utensils, pails, etc., must be kept scrupulously clean, and that there must be regularity in feeding.

Be careful never to overfeed the calf. There are more calves killed by overfeeding, than by underfeeding. See that your calf stable has plenty of ventilation and light; that your calves are well housed in the winter time; but do not pamper them,—keep them growing and thrifty. As they begin to eat the coarser foods, corn-fodder, shredded, is a very good food.

In feeding skim-milk, it must always be fed at a uniform temperature of from ninety-six to ninety-eight degrees. A dairy thermometer should always be used. Never allow the calf to run wildly about after feeding, as it will upset the bowels, and cause scouring. When the calf is eight months old, it can be weaned from skim-milk, and put to pasture, or fed on clover, roots, ensilage, ground oats or bran. The object to be kept steadily in view is to obtain growth of muscle and sinew, but never fat.

The heifer should be bred to have her first calf at about twenty-four months old; but as they often do not hold to the first service, it is a good practice to breed them at about fourteen months old; regulating the "service" somewhat, by the growth and size of the heifer.

When the heifer has been in calf about five months, the foetus she is carrying will begin to be a tax on her. It is then necessary to feed her pretty liberally (but never with fattening food). If on pasture, and the pasture is scant, supplement it by ensilage, and oats or bran,—more of the former than the latter.

An excellent way to bring up calves of four months or over, is to let them run out in a barn-yard of their own, with a low penned stable or lean-to, in which they can take shelter at night or in very bad weather. Let the windows face to the south, and have doors opening into the yard. A long feeding trough, with a hay-rack, can be built at the back of the lean-to, and run the full length of it. Fresh horse manure can be hauled in daily, and put on the floor, which need not be planked. The horse manure will give heat to the calves at night. Permit the heifers to run out whenever they want to. You will make them strong by this process, and give to them a grand constitution, as well as a predisposition to resist tuberculosis.

With the first calf, the heifer should be stimulated by regularity in feeding and milking, to keep up a good flow of milk; and to maintain this flow pretty close up to the next calving. The object is to fix in her continuity of milk.

It is generally known to most men that I am a staunch, unswerving and persistent advocate of the Jersey as the greatest and most important factor in economic butter making. I have not a drop of Scotch blood in my veins; so my persistency in advocating the Jersey as I do cannot be attributable to my heredity, but can be to my solid conviction, founded on fact, that for economic production in the dairy, the Jersey is without a peer, for the following reasons:

1. She comes into profit at two years old, and is a profitable producer to a ripe old age.

2. Her tenacity in milking and consequently in butter making, is a fixed characteristic, established beyond all doubt.

3. As an all-round year's milker, on an economical consumption of food, no breed can approach her.

4. Her milk contains a greater quantity of butter per hundred pounds than that of any other breed.

5. The quality of butter and cheese is of the very best.

6. She can assimilate and properly take care of her food, to better advantage than any other breed.

In conclusion, let me urge every dairy farmer to study his cows closely; learn their individualities and needs; supply such needs, tempered by judgment; seek by careful selection and coupling, and by skillful handling and feeding to make the daughter better than the mother; be as true to your cows as they have been to you; and they will prove not only a pleasure to you, but the most profitable bank account you can have, a worthy heritage to be handed down to your sons and your daughters.

Ques. What would you do in the case of scours attacking calves soon after they are born?

Ans. If Mr. Van Dreser is here he will remember that at one time that disease ran the length of Delaware county in the state of New York, and Otsego county, and the method that was taken to counteract it was to give a teaspoonful of powdered earth to the calf very shortly after it was born, and to give three teaspoonfuls of powdered earth per day, allowing the calf to suck the mother once and then giving milk from another cow, adding some lime water to the milk. Others have used powdered charcoal. It is presumed that the poison that comes with the calf is in the intestines at the time, and the powdered earth absorbs it and gets rid of it. No ordinary medicine, no medicine that I know of that will generally reach genuine cases of calf scours, has any effect on this. Powdered charcoal, or powdered earth, three teaspoonfuls a day at first and gradually increased as the calf gets older until two or three tablespoonfuls a day are given, seem to be the best means of curing that trouble. It is contagious beyond any question of doubt, and when it strikes communities I have known nearly every calf in a herd to die from it.

Ques. Would you give the same treatment to a calf that had the scours after he was older?

Ans. No. This is a case where they are generally attacked within five or six hours after they are born and they generally die within twenty-eight or forty-eight hours.

Ques. What do you give for the scours when a calf is a week or a fortnight old?

Ans. That is a different sort of scouring altogether. One of the best remedies is a mixture of whiskey, pepermint, Jamaica ginger and catechu.

Ques. To what extent can you feed cottonseed meal to a cow from which you expect to get butter?

Ans. I never would feed a cow more than two pounds of cottonseed and she must be a thousand pound cow at that. I do not believe it is safe to feed any dairy cow more than two pounds of cottonseed per day.

Ques. What would be the effect if more was fed?

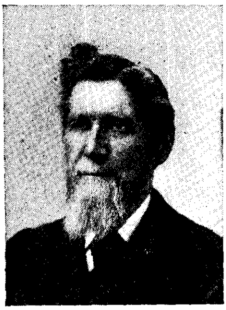
Ans. It would have a tendency, first of all, to affect the flavor of the butter, and a tendency to heat the cow, inducing possible garget in some cases, and a tendency to abortion.

Ques. What do you think about this nutritive ratio? Is there any such thing for all cows? Will not one cow require a ratio of one to four and another a ratio of one to nine? Can we get at a general average intelligently and practically in our business?

Ans. I think it will depend upon the individual cow. I remember at Chicago, when I was feeding cattle for the World's Fair dairy test, I found that I had to treat some cows entirely different from others. Some cows would take an enormous quantity of corn and very little bran and do well. Others would do poorly with large quantities of corn. I had to take the individual cow and find out what suited her. I had my cows there long enough to know the individuality of each cow and that is how I won the test. It all depends on the individual cow, in my judgment.

THE IMPORTANCE OF THE DAIRY INDUSTRY TO MAINE.

By Hon. Z. A. GILBERT, Greene.



Z. A. Gilbert

We have no reliable statistics of the dairy business of our State. The production of the creameries and cheese factories is on record, of course, at the places of manufacture, but we know well there is no person with any authority to draw upon them; they are not available for public use. Hence it is entirely useless to attempt to represent the magnitude of the dairy business of our State by any array of set figures. I make no such effort. There are 64,000 farms in the State. Every one of these farms, substantially, keeps more or less cows. In addition to these, there are a considerable number of cows kept in towns and cities that do not count on the farms. Moreover, every person in our State, from infancy to old age, is a daily consumer of the products of the cow. A vast amount of milk especially, and also of cream, butter and cheese, is consumed on the farm where made, and never appears on the market or at second hand. In addition, also, to all this consumption of the products of the dairy among our own people, we are sending a large aggregate of milk, cream and butter to meet the daily wants of consumers in other states. Still, none of these productions are within reach to be set down in figures. Yet it is easy to see that all together they represent an amount of vast economic importance. It does not need an array of statistics to prove the importance of the industry to our State. Then, again, the dairy business of this State is not by any means measured by the milk, butter and cheese produced. Cows for market are as much a product of our dairy business as milk and butter. We are rearing calves and growing them up into milch cows for sale on the market, in large numbers. Two or three hundred cows go out from our State each week of the year to supply the wants of dairymen in other states; great, noble, strong, healthy, vigorous cows, the equal of any to be found either in our own country or abroad. There never were so many valuable cows shipped from the State in a single year as during the year just passed. There never were so many of a like quality left behind. Maine is the great back pasture of the more densely populated state of Massachusetts. This great cow raising branch of our dairy industry shows the importance of just such teachings as the good judgment of the officers of our Dairymen's Association have provided for us this afternoon. I make no attempt, I say, to represent the importance of this industry in figures; they are not needed. Nor do I attempt a comparison with other of our staple productions. Beef is now on a boom, but its luscious steaks would lose their attractions without our Jersey butter to tone up their flavor. Sheep deserve the appreciation they are receiving; rightfully may we boast of our expanding orchards and laden boughs of fruit; Aroostook may boast of her harvest of Hebrons and Early Rose; our forests may yield their timber; but over them all lie the products of our dairies. Three years of time are used up in the making of beef, the sheep yields her fleece but once a year, fruit grows only in summer, and potatoes will compensate their growers only on the return of autumn; but the cow gives her milk to-day, to-morrow it is made into butter, the next day it is exchanged for cash, and in thirty days' time the money is in the pocket of the owner of the cow. In no other of our farm industries are the returns so prompt or so sure. To a business man such promptness and security are factors of the greatest value. They are none the less so to the dairy farmer. The dairy makes the farmer and the farm rich. The farmer increases in wealth, the land in productiveness. A business so necessary to the wants of the people, so profitable to the operators, so advantageous to the land, may well receive the fostering encouragement of the State.

Dairying is to-day easily the leading branch of our farming, bringing to the operator the most ready money and leaving the land in the best possible condition to continue its production. For several years past I have been greatly interested in watching the development of the dairy industry in the Dominion of Canada and the methods through which it has been accomplished. The landed population of the Province had arrived at the stage where some money must be derived from the land. Far-sighted men, real statesmen, saw this. There was the quickest money from the business of dairying, and efforts were centered on its development. Though only a few years have passed, yet the progress made in that time has truly been marvelous. In referring to this progress Prof. Robertson, the able Dominion Commissioner of Agriculture, at a late convention, among other instrumentalities in its aid, gave great credit to the press. "The press," said he, "is a unit in its aid." He might well have included the government of the Dominion also. Their government has studied ways and means through which the industry might be hurried up in its development. With the press and the government united and studiously working to aid in the common cause, it is not surprising that the results have been such as they have. Think for a moment what might be done in this State of ours with the industry which we are gathered here to represent, were the government and the press united with us in a strong pull and determined purpose to build up and perfect this profitable industry to the greatest practicable limit. I make no criticism on the State. The eyes of our public men, leaders in the State's industrial prosperity, our boards of trade, our statesmen, have been centered on other objects. I believe I am correct in the statement that this occasion is the first time that any of the several boards of trade in our cities ever did honors to a Dairymen's Convention, and I doubt to-day whether the State Board ever had the special matter of the business of dairying under consideration, or even have ever realized that in this industry is an opportunity to coin millions of wealth for the State, or that for every added demand secured through this source the land from which it comes is increased in value and increased in its power to go on to still greater productions. Nothing can be more important to the prosperity of our State than that its people, its press, its boards of trade, join in a united effort to develop and perfect this important farm industry so well adapted to the surroundings in which we are placed.

Hon. H. C. ADAMS.

We never have time at these dairy conventions to find out all we would like to find out, but at the same time, out of these papers and these discussions, a good deal of which we lose, there is deposited in almost every mind a little of the golden sediment of true knowledge. Let me give you one of my experiences in the dairy business. At one time I bought forty-one cows and added them to my dairy. They were in pretty good condition, they looked round and smooth, and I thought they were good cows, but when I came to milk those cows they did not give milk enough. I was in debt, and I was selling milk at five cents a quart, and I wanted to get out of debt, so I wanted more milk. We did not have the dairy literature in those days that we have now, and I tried all sorts of feeding experiments. I fed them clover hay and timothy, and corn fodder, and I fed bran, shorts, corn meal, oat meal and rye bran, and I tried linseed and all sorts of combinations. I tried feeding them hay twice a day, and I tried feeding them five or six times a day, and I had the hired man get up in the night and feed them, but to my despair and digust the flow of milk did not increase. I was talking to an Englishman one day, and he said, "Why don't you try giving them warm water the way they do in the basement stables of London?" I started after the warm water, and I made a tank long enough to reach in front of three cows and bought one of these kettles that will hold forty gallons, filled it with water and heated it to the boiling point and filled my tank half full, and then put in cold water enough to bring it up to the temperature of the blood, and stirred in a little shorts, and it is a fact that inside of a week I had increased the milk supply about twenty per cent. That was ten or fifteen years ago, and for ten years, every winter I gave my cows all the warm water they would drink. They never would drink more than once a day, but they would drink very large quantities. That was before we had any silos. The effect was twofold, or threefold. In the first place the warm water, taken in such large quantities, had the hygienic effect of the feeding of a lot of roots which are mainly water and the principle value of which is in bringing the digestive organism into a more healthy condition. It washed out all the channels of circulation, the excrement was of the right condition, their digestions were strong, their appetites were good and in the month of March those cows shed their old coats and came out in the spring as sleek and smooth as cows usually are in June. The average Wisconsin farmer at that time was letting his cows go out when the thermometer was at zero or ten or twenty below and go to a tank of water at a temperature of about forty degrees, and drink. When the cow had drank a lot of that ice water what did she do? She began to heat it up through the heat of the blood. How did she get that heat in the blood? By eating food; and so the Wisconsin farmer was buying corn meal to heat up that water for his dairy cows. He was wasting money on corn meal that he might have put into cord wood at less expense. This was one of the experiences that may be of value to you.

I want to make a reference to a little editorial statement in the Sun of this city, in which it was stated that the discussions of the Dairymen's Convention were somewhat technical and would not interest the general public, except that the discussion of the question of food might interest some other people. And the editor went on to say that this question of food adulteration could probably not be settled by the establishment of costly offices by the State, and having a lot of men running around to root out these frauds of adulteration. The way to correct the evil was for the people to buy their goods of merchants that were reputable and honest. That statement was undoubtedly made in the best of faith. I do not want to criticise the integrity or the patriotism of the gentleman who runs that paper, but I do want to criticise his judgment. In the state of Wisconsin you could go into almost any reputable grocery and ask for a line of foods that were being adulterated and in a great many cases you would get those adulterated foods, sold by a well-meaning, honest merchant because his neighbor right by his side who was not so reputable and honest was selling that kind of goods, and in order to meet that competition he thought he had to do the same thing. Talk about reputable merchants! I want to say to you that one year I arrested forty of the most reputable merchants in Wisconsin for selling common spirit vinegar for cider vinegar. And let me say further that these laws designed to prevent the adulteration and misbranding of foods are just as much in the interest of the grocery trade as they are in the interest of anybody else. The leading grocery men in Wisconsin are coming to me and saying, "We like this law. We do not want to sell these adulterated goods, but we have sold them because our competitors did and compelled us to do so. We prefer to sell goods to our people that are straight." The Wholesale Grocery Association, which originally was opposed to the law regarding pure foods, is standing behind this department and doing what it can, in the way of scattering circulars, etc., to induce all the travelling men to buy straight goods. Let me give you an example of how the law works. I arrested a certain gentleman in Wisconsin for selling lemon extract without any lemon at all in it. He was very indignant and sent for a representative of the Chicago house where the goods were purchased. The representative came to me and said, "What are we going to do about it?" I said, "Plead guilty and pay your fine, and then I want your house to keep all those adulterated goods out of the state of Wisconsin. Send them wherever you see fit but do not send them to us." He said, "I will do that." He pleaded guilty and paid his fine and the firm took those goods all out of the state of Wisconsin and we are not being flooded from that source with any counterfeit goods. What is true of that firm is true of a great many others. I tell you, farmers, you are producing your butter and your cheese by hard work. I know what it is and you know what it is. It is not an easy thing to follow this dairy business. It is a business that requires constant labor and constant thought. It is due to you that this other product, the product of the hog and the product of the steer, that is staring you in the face, should be kept out of your markets when it is colored in imitation of that product which is the result of your labor. I say that your legislature should declare, through legislative enactment, that counterfeit foods must not be sold in this State of Maine. I say that your legislature should say, and that some officer, I do not care who, should carry out that saying, that no counterfeit dairy products should be sold to crush down a great and valuable industry of this State of Maine.

I want to say one other thing. In making these fights for honesty in trade, for the protection of your own business, do not abuse anybody. Make an affirmative fight, never make a negative fight. Do not waste very much time in abusing anybody, and in all your farmers' organizations, as I said this morning, work together in harmony in spite of all things and be charitable in your judgment of other men. I heard a legend once about a certain village in Germany in the 12th century where domestic wars were raging. In that village there was a church, and in the great tower of that church there hung a bell. In one of the raids that were made there the bell was carried away, and the people missed its tones and its call to prayer, but they did not have any money to buy another bell. The old priest called them together and said, "Now I want each one of you to give something." And so the widow brought her mite, and the young men and the young women brought their ornaments, and the rich lady brought her gold and the soldier brought his sword. All these offerings were gathered together and melted down and a bell was cast and it was hung in the church tower; and when on the next Christmas morning its tones rang out for the first time all the people wondered why there was a melody in the sound that was never heard before. It was strong with the strength of courage, rich with the aspiration of beauty and of youth, tender with human love, glorious with human charity. And so in this State of Maine, in all your associations with each other, in exercising the rights of citizenship as people of one commonwealth, let each and every one of you bring something for the public good; and never forget that, no matter how poor you are, or how uneducated you think you are, you owe something to this State of Maine. Let each and every one of you help to put those influences and those forces into existence and into action which will tend to establish peace and harmony and honesty.

HENRY VanDRESER.

The chairman says that he wishes me to talk a little while upon poultry, and so I will give you, in brief, five or six months of our experience. We are largely interested in poultry to-day. In our early life, when we were paying for the farm that we first purchased, through the dairy cow, our thoughts were not along that line, but I became very much interested in a boy in our town who had a natural love for domestic animals. He loved everything that had life. That is why I was interested in him. He had keen perceptives, and when I was called away from home in a business way on extended trips I would have that little boy come to my house and look after the comfort and care of the animals. We were feeding cattle for the show ring in our state and other states. On my return, before I would have an opportunity to get into the house, he would call me down to the stable and with pride and dignity in his heart would say, "What do you think of the development of those animals left in my charge during your absence?" He was happy only when he was doing something along that line. I became so much interested in the boy that I told him that if he would furnish the brains I would furnish the money and give him a course in Cornell, an agricultural course. During his absence I purchased my brother's interest in the farm we first paid for, and my wife and I were left alone on that large farm; and as we had no issue I wrote to the boy and told him I would like to have him come with me. He wrote immediately saying he would come. He had taken a course in poultry and was very enthusiastic over the results in the study that he had made, and so he called my attention to the business. I want to say to the fathers right here, you should respect the opinions of your sons, they demand your respect. You should encourage thought. Thought is a power behind the throne; thought rules and governs this nation to-day. We sat down and talked the matter over together. It seemed feasible, and we at once went into the poultry business. We sent for an incubator, and put it into the cellar of our house as we had no other place. They took our insurance away, but we made up our minds to go into the poultry business, fire or no fire, and the chances are that if a man has no insurance at all he is not so apt to burn out. We started in a small way, and as we grew in knowledge we extended the plant. We felt so elated over the first effort in the business that we instantly increased the plant. I want to say right here that you should be careful before you go into this business that you thoroughly understand it. Begin in a small way and as you develop in knowledge increase your plant. I know men in New York who very foolishly put thousands and thousands of dollars into the poultry business. They decided in haste and repented at leisure. It becomes a man to go carefully.

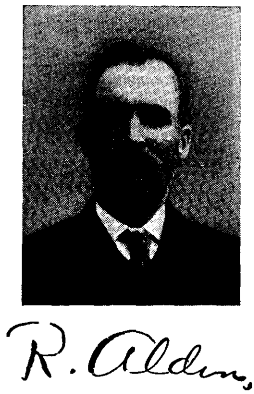
The question is often asked me, What is a good ration for a laying hen? The first essential is water. Seventy-four per cent of the egg is water, fourteen per cent albuminoids, and ten and one-half per cent fat. Now when a housewife opens an egg into a saucer and holds it up and looks at it, if the white of the egg is watery we know what is the matter. The hen has not had protein enough. We should thicken that egg by feeding plenty of albuminous feeds. Peas and oats are a most wonderful food for laying hens. Oats have gimp in them. They will make a horse trot, a rooster crow and a hen cackle. Ten and one-half per cent of that egg is fat, and you want to feed something rich in fat. Yellow corn is a very nice food. It makes a yellow yolk. I know a great many people in New York, especially on Fifth Avenue, who, if we feed cabbage in Cobleskill and ship the egg to New York, will break it and hold it up and exclaim "cabbage!" We are not allowed to feed anything but beets for succulent foods. If the yolk is white, too much buckwheat is being fed. To make the yolk yellow and attractive, feed cottonseed meal or yellow corn. If the egg is brittle and soft, there is not lime enough. You can regulate that by giving plenty of slaked lime. That thickens the shell and the albuminous foods thicken the white of the egg.

There is one thing that I want to speak of to the ladies, and that is this: We have a regular cooking day of cockerels that we want to put away for the winter months. Just before Thanksgiving we have a butchering day, and my wife and the hired girl go down into the kitchen and cook those chickens, fricassee them as though they were going to put them on to the table, and put them into quart and two quart cans, and put on some of the chicken oil and run the tops right on. I do not know how it is with you in Maine, but in the state of New York we farmers live better when we have company than when we are alone, and instead of keeping those roosters all the year and feeding them corn we kill them early in the season and put them into cans, and have them ready for company. You know how it is in a village. We live two miles out and the village people will drive up at half past nine with the idea that the housewife has nothing to do except to get a meal three times a day. When we see somebody coming that we think is coming to our house, my wife runs in and gets her apron on, and says, "How do you do, I am glad to see you" (and sometimes she is), and she invites them into the house and I help put up the team. Then she asks to be excused and slips down cellar and gets a can and runs the top off, and makes some biscuit and fries the chicken, and they compliment us upon our fine dinner and we do not let them know but it is an every-day occurrence. It is something that we all need sometimes,—a meal which we can have ready in a very few minutes; and I want to impress upon you that you can have chickens in the early fall and not feed them all through the winter and let them eat their heads off, but put them into cans and have them ready for use at any time during the winter.

We have 2,600 living chickens on the farm to-day, and are getting thirty-seven cents a dozen for our eggs, under contract, for six months, and twenty-five cents for the other six months. Our cockerels are put into the market when they will bring twenty-five to twenty-eight cents a pound. There is money in the business, and I am sorry that my attention was not called to the poultry business earlier in life. There is an opportunity for you along this line. New places are being developed for eggs all the time. At Bermuda a new field is open, and it is so on the islands, and the time will never come when there is a surplus of good eggs upon the market. And I want you to feel sure that there is more money to-day in the poultry business, for the money invested, than in any other business I know of. We raise all the grain on the farm. Our wheat, our sunflower seeds, our peas and oats, our buckwheat and our millet,—everything we feed our chickens is a product of the farm; and I want to tell you that as an adjunct to dairying there is nothing better, and I hope to hear that the State of Maine has gained laurels for herself in this business. You had a beautiful exhibit of chickens. I had the honor of judging them, and I hope I have been judicious in the judgment, and I hope to hear in future years that you have taken advantage of this opportunity, and have begun to breed chickens for the money there is in the business. Nobody is doing work for fun, life is too short. We are interested, as farmers, first to have a good home and then to make that home as attractive as possible, and I know that we shall be happy.

ADDRESS.

By Hon. Rutillus Alden of Winthrop, President of the State Dairymen's Association.



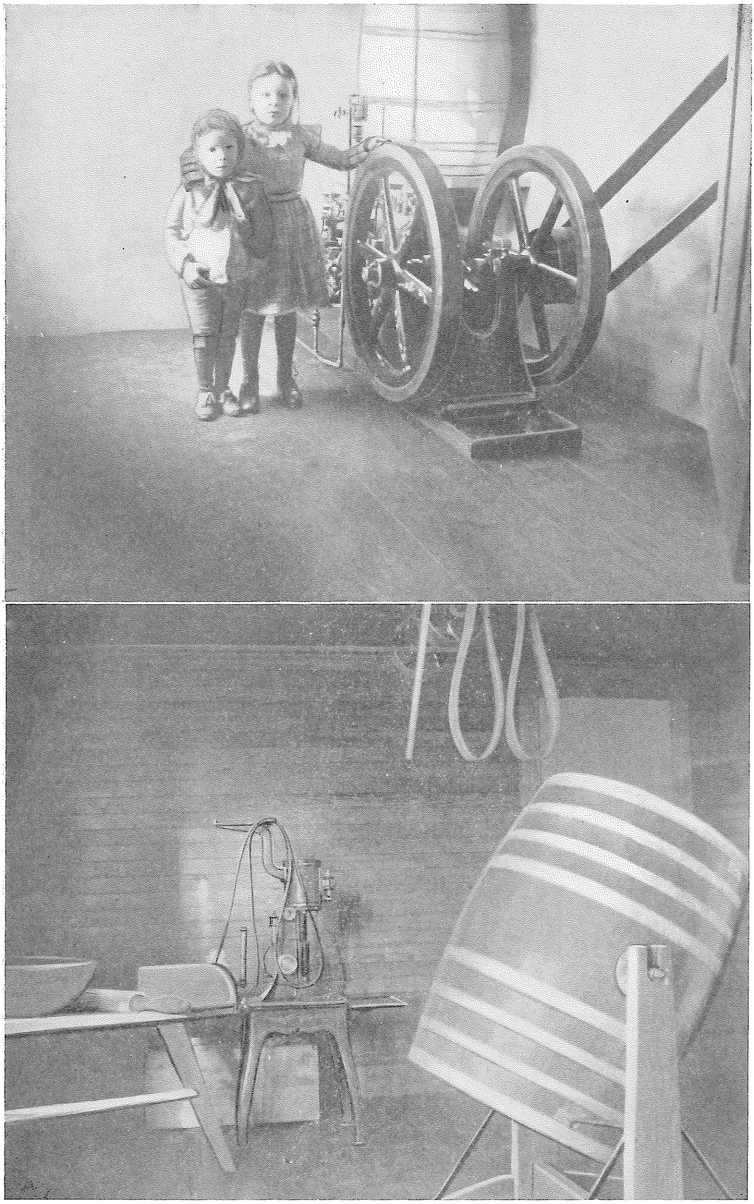
I look back to the time sixteen years ago when I went to Massachusetts and Connecticut to investigate the butter factory business on the cream gathering plan and became so enthusiastic that I obtained plans for a butter factory, and came home and reported to the farmers of Winthrop and a delegation from the town of Wales, which resulted in the building of two butter factories that season which were put in operation at once; one was located at Winthrop and the other at Wales. I felt then that if I could be the means of introducing butter factories into this State it would be of untold value to the future development of Maine, and I have not altered my mind since then.

Through the untiring efforts of the board of agriculture butter factories have sprung up in many towns, bringing millions of dollars into the State every year. For butter and cream one factory alone, the Turner Center, has received for the year ending October 1, $497,746.81, almost half a million dollars. Think for a moment of the vast sums of money that are being paid out to the dairymen over this State where sixteen years ago not one dollar was received for factory butter or cream.

I want to ask you how Maine butter stood on the Boston market at that time. Its reputation was anything but enviable; it had to be sent there without being stenciled and was there marked New Hampshire or Vermont butter. To-day, Maine butter from our best conducted factories brings satisfactory prices.

The future of the dairy business of this country is beyond our power of comprehension. Through the efforts of our secretary of agriculture at Washington, new markets are being opened up where our butter is bringing good and satisfactory prices. I predict that in the near future, China, Japan and the Philippine islands will call for a large amount of dairy products from the United States. That Maine will rank among the foremost of the New England States in the dairy business, I have no reason to doubt. Let us use our influence to bring this about, let us see to it that we take rapid strides in the dairy business. Why should we not, pray tell us? We have the best breed of butter cows in the world and as sweet grasses as grow beneath heaven's sunlight, covering our hills and valleys with their green verdure, which gives a sweet aroma to butter that cannot be excelled. We have the purest spring water gushing from our hills and feeding the brooks and rivulets that can be found under the canopy of heaven, and have the coolest atmosphere in this country. Now with everything in favor of the dairy industry why not proclaim dairying for New England, and let the bonanza farmers and large ranches of the West have the beef business? We cannot compete with them in producing beef at the prices for which they have been raising it, we have tried and failed. With better prices for beef some of us are situated so we can make a dollar, especially farmers who live at a distance from railroads and have good hay farms and an abundance of pasture. But we can compete with the West in a fancy article of butter, as our nearness to first-class markets enables us to give our customers a nice article, fresh made every week, and I am pleased to say there are hundreds of private dairymen who are realizing fancy prices for their butter from private families in our large villages and cities in this and other states.

Our cream trade is getting to be immense, not only at home but in our neighboring states. This trade has nearly all grown up within a few years. Our enterprising friend, Mr. E. L. Bradford of the Turner Center creamery, first conceived the idea of shipping cream in large quantities out of the State; many others have gone into the business, until now there are being shipped carloads of cream from this State every day to be used the next. Cream was once considered a luxury only to be used by the rich, but now it has become a necessity, and you will find it on the table of many a laboring man. The more it is used the greater will be the demand. Several years ago cheese fac-



SECTIONS OF DAIRY ROOM OF R. P. CURTIS, HILLSIDE DAIRY FARM, MONMOUTH.

Machinery run by three horse power Lambert Gasoline Engine.

tories seemed to spring up all over the State. For a while they were a success, until the low prices and bad management of factories drove many of them out of the business. Those who still continue to run their factories are making a success of it. At the present price of cheese, thirteen cents, it will give the farmers a good, clean profit.

Who was there among our wisest men, a few years ago, that had the faintest idea that we should be shipping milk by the carload every day from the interior of Maine, but such is the case. A car of milk and cream is shipped from Winthrop to Lynn every week day. One man there is now producing over 150 gallons of milk a day, which at ten cents a gallon amounts to over $15 a day—a fair income for a Maine farmer—while some others are producing from 500 to 1,000 pounds a day. Our milk trade with Massachusetts must continue to increase with the population. Some may ask, "Why go so far for milk?" The answer is, the people of Massachusetts are demanding a better quality of milk than is produced there. The milk that is being shipped from Winthrop will average to test close to five per cent butter-fat. Do you wonder that they call for Jersey milk?

Just contemplate the change that associate dairying has brought about. Think of the large amount of work it has taken out of our houses. Our women folks get a little rest, they are more contented and happy, and farm life is more to be desired. Flowers adorn our homes instead of tin pans and the churn and butter worker. Our wives and daughters appreciate this relief and try to make our homes the happiest places on earth.

The dairy industry of Maine should have the fostering care of an association, composed, as our association is, of producers and manufacturers, who should unite and work together for the building up of the different departments of dairying, and to look after our interests, which are many.

Look at the state of Wisconsin where they have a good live dairymen's association. Their farms have nearly doubled in price since they have taken hold of the dairy business in earnest.

What has been done in Wisconsin can be done in Maine. The lack of an interest in this branch of farming has been one of the prime causes of so many run-out and abandoned farms in this State. As the business is built up our farms will increase in price and the State valuation increase in the same proportion.

There is a large amount of work to be done by the association. We should have a State inspector who shall inspect our creameries and work to improve the quality of their products. He should travel over the State and visit all of our creameries, and inspect the methods of collecting, receiving and handling cream, also the manufacture of butter and its quality. He should be a man who thoroughly understands the business and he should impart instruction and make suggestions how to improve the quality of our dairy products. It should be his duty to visit the patrons of the several factories and inspect their methods of milking, and caring for their cows; also to look after the tanks and their surroundings and see that the milk is not set in filthy water that will impart odor enough to one lot of cream to spoil a whole churning of butter, as is now done in some cases to my certain knowledge.

Our dairymen need practical instruction at their homes and will take kindly to it when they are convinced that by so doing they can improve the quality of butter their cream is to make, and in this way get a better price for it.

We have in our State, as returned to our State assessors this year, 143,833 cows; now I believe it is possible by giving the instruction to our manufacturers and dairymen which I have suggested, to increase the price of Maine butter two cents per pound. Supposing the milk from 140,000 of our cows was manufactured into butter and these cows averaged two hundred pounds per cow, it means $560,000 to be divided among our dairymen. But we will take the estimate of Prof. Gowell one year ago, that our cows will average 150 pounds per cow; this would give our dairymen, at two cents per pound, $420,000 more than they are now getting, or even if we can improve the quality so that our butter will bring one cent more a pound, this would give us $210,000, which would be a clean profit, and I have not the slightest doubt but that this can be done if this State will give us money to pay the expenses of an instructor.

If you wanted to find out how many woolen and cotton mills, machine shops and other mechanical industries there are in the State, you would go to Commissioner Matthews' report and find every item there, and he also reports the number of cows in the State; if you wanted to know the number of fish that have been put into the lakes, ponds and streams, you could find out by Fish Commissioner Carleton's report, but if you wished to know the number of creameries, butter factories and the amount of butter, cream and milk produced and shipped out of the State, pray tell me where you will find the information? It cannot be found. Why not? Because we have had no dairymen's association, consequently have had no dairy commissioner, neither has our board of agriculture had money to pay the expense of getting the statistics.

Are not our dairy industries worth looking after?

Our association was informed by the superintendent of one of our leading creameries that if a testing station were established by us it would be patronized by them. We have been aware for a long time of the distrust and disaffection that exists among the patrons of our creameries. They feel as though the testing of cream was like passing out their wallets with uncounted money to be returned after it had been counted by another, and leaving it entirely to that person to say how much money there was in the wallets.

That this feeling exists no one can deny. We believe if the testing can be done entirely independent of the creameries, by an expert who is above reproach, it will remove one of the greatest obstacles in the way of associate dairying. A great many of the patrons mistrust they are not getting what honestly belongs to them in their tests; and for this reason have no confidence in the business. Many of them could easily increase their number of cows and would do so if they had faith in their tests. We have opened a station for this purpose, which is located in Auburn. We have for several months past done all the testing for the Turner Center creamery. To the credit of our factory managers I would say, several of them have indicated a willingness to have their testing done by us. We are now contemplating enlarging our capacity for handling and testing samples of cream and are in hopes soon to be able to do the testing for several other factories.

I claim the honor of being among the first to suggest the establishing of the dairy school at Orono, which is so ably conducted by Prof. Gowell. This school has graduated some bright young men who have fine positions at prices that ought to be satisfactory to any young man, and I earnestly hope this association will do all in its power to help build up this school and make it a credit to Maine, as it certainly will be if it is patronized by our young men.

In conclusion I would say, in behalf of the officers and members of the Maine Dairymen's Association, I wish to extend our sincere thanks to Secretary McKeen and the board of agriculture for their kind and generous invitation to hold our meeting in connection with their dairy conference. Let us all work together to build up the various branches of agriculture in Maine.

A GENERAL TALK BY HENRY VanDRESER.

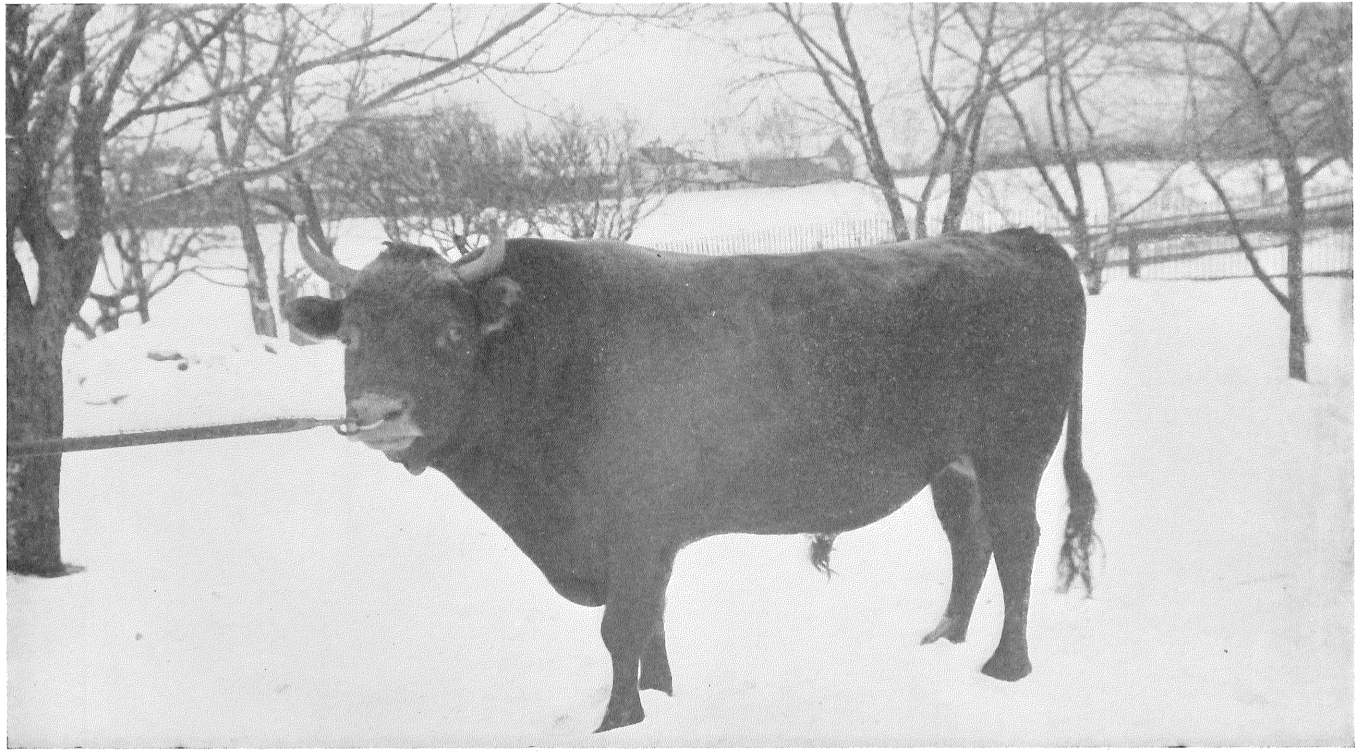
Do you realize that we are the cream of society? We stand to-day pre-eminent. We feed and clothe this nation. On our success as agriculturists depends the success of the professional men to-day. If we would just consult among ourselves, talk the matter over earnestly and give it thought, there is brilliancy enough among the farmers of the United States to do their own business, and they can do it if they will. We are more closely allied to nature and nature's God than any other profession. I want to say this to the farmers of to-day: Never be afraid of developing that which you have, the live stock which is in your possession and in your care; look well after their wants. Because God will not let the sun shine on a surplus of anything good on earth. Ever since the birth of Christ we have been trying to breed a surplus of good people. Have we accomplished it? No! We never will. The standard is constantly being raised. In my boyhood it required only a very little education to till the soil, and till it profitably and secure large crops. To-day it requires a better education to till the soil and do it intelligently and successfully than it does to preach the way to Zion, and if there is a minister in the house to-night he will acquiesce.

As I go over the state of New York and the various states in this Union, as has been my privilege, in a business way, my heart has been made sad to see the condition of so many farmers. They are so careless in their business. This meeting was for the purpose of calling you together to talk matters over, and if a man knows his duty and does it not, the greater is his condemnation. And I want to say to the people of Maine that you have had a glorious meeting here, one of the best meetings I have ever attended. You have shown an earnestness of heart, interest of spirit, and willingness to learn and accept the knowledge that is in store for you. I have been in societies where they turned a deaf ear to all the knowledge that was in store for them, would not accept the truth of the gospel of agriculture as it was preached to them, but would often deliberately go out of the room, scorning the speakers upon the stand. God pity that class of people! I tell you, gentlemen, when we are thirsting after knowledge we are willing to accept the experiences of others. That is what we are here for to-night. There is a new clock in the agricultural tower, and it strikes at the nation's call, and constantly new converts come rolling into the different agricultural colleges, thirsting after knowledge. Although God in his wisdom has not seen fit to give me any issue, it has been my pleasure to educate three boys no kin to me, and put them into the different agricultural colleges in the state of New York, and they are the pride of my heart to-day. And we have another little six-years-old boy, an orphan, and as I wanted to perpetuate the name, I call him Henry Van Dreser, Junior. He is the pride of the household, and the prayer of my heart is that I may live to give him an agricultural education. And I want to say that no house is complete without music, children and flowers. The best crop ever raised on a farm is a crop of children, well educated and well bred. When I go into a house I know if there is any culture there, as when I go into a stable I can size up a man's disposition. If the cows switch their tails and look around for somebody to hit them, you can make up your mind that the man has a sour disposition. And so when I go into a house where there are children, if there is any culture there it is very perceptible. What a blessing it is for the farmers to rear their children on the farm! There is a lesson in every plant, in every flower, and in every crop. There are lessons in the stable, in the orchard, and in the poultry department. How much comfort I have taken in developing our flocks and our herds, in the dairy and in the fields.

I am in a dairy district, and I want to say that it makes no difference how well a calf is bred, you can ruin that calf in rearing it by feeding a heat-producing food. When you feed a heat-producing food you dwarf its milk flow and impair its usefulness. You want to feed a food rich in protein, rich in muscle and bone and blood, and develop that calf in a way that when it becomes a mother you will be paid for your labor. There is one thing that every man can do if he will, he can weed out his poor animals. How different with humanity! When you get a surplus of stock on hand, among the human race, that do not pay their feed, you have them on hand just the same. But it is by common consent that we allow this condition of things to exist on our farms, and we can better our condition by simply working along the line of better breeding. In my early life I never gave it a thought, that I was on earth for a purpose. The error of a moment may be the sorrow of a life, financially or otherwise. And for that reason, although we are benefited by the mistakes that we make, largely, yet life is so short that we do not want to make so many of them. And I am glad my attention was called so early in life to better breeding; it was the only way out, for me. And we have so many farmers all over the United States who are suffering from indebtedness. The man that hardly knows how to keep the wolf from the door I have sympathy for, and I want to tell you what we must do. We must have plenty of courage in all the avocations of life. Prices will strike bottom. We have been living under a depression. Land has depreciated in value, and crops upon the markets of the world have hardly paid for the raising, hardly paid a man for the help he had to hire. But now the boom is on. The hum of the spindle, the click of the hammer, are being heard again throughout this nation; the products of our soil are bringing a fair profit. Butter has gone up, eggs are worth more, and all the products of the soil bring better prices. Cattle are, to-day, worth a great deal more than they were a year ago. Let us be encouraged, and let us go to work and till the soil intelligently, and our farms will blossom as the rose, and we can put the products of our farms upon the markets of the world at a profit.

I am giving rather a promiscuous talk this evening because I was not aware that I was going to be called upon. I hope you will all make the best of what you have and turn everything into account. Let us look at this old way of keeping hens, for instance. Our attention was not called to it for years and we never watered a hen. We never went into the hen-house to look after any eggs, because there wasn't any particular need of it, there were no eggs, and there were other things there. The hens in the winter, around on the snow banks, would stand on one foot and turn their noses over into a snow bank to get a little water to cool their parched tongues, and that was all the water they had. After my boy called my attention to the poultry business, one day he called me to the poultry house and I went in and looked around. What do you suppose was there? A lot of nail kegs, two grindstones, and a lot of dead hens. I had not been in there for years. I said, "What shall we do?" Paul says, "Let us reason together," and that is what I should like to see more fathers and sons do. Let the son be your companion, and you will be surprised to see the difference it will make. He said, "Go to work and tear out the interior of that old house, and put it on the fire." I said, "All right." We went at it, and when we had torn it out we poured on some kerosene and scratched a match, and away it went like a rocket, 100,000 lice to the square inch. Then we went to work and sealed up the hen-house and stuffed it inside with straw and tarred paper, and put in a new floor and a watering device. Well, you know there was something on the old hens besides feathers, and we did not dare to put those hens back into the house—"filthy communications corrupt good manners"—so we let them roost down in the orchard in a lot of old trees, and just before Thanksgiving, we made up our minds that it was a good time to get rid of those chickens, so we went out and caught them one night, and the next morning we heated some water and had a regular picking time. We took out the pin feathers very nicely, and then we laid the chickens on the tables, and put a kettle of hot water on this side and a kettle of ice water on that side. Then we dropped them into the hot water long enough to count five, then took them out and put them into the ice water. You see the hot water threw the secretions to the surface, and the cold water checked it, and when we took them out they puffed away up and looked as sleek as ducks. Then we laid them on the table until the next morning. The boy was just as much interested as I was, and I guess he learned some of those things at Cornell. We let them stay until the next morning because we did not want to get them out of shape. In the morning we got some cracker barrels and filled them with those chickens, and shipped them to a commission man in New York, and we got a much larger check than we expected; but we never have shipped that commission man a chick since. Then we got into better company and went on.

When the fair was at Toronto, I went up there to judge the cattle, and when I got down to Niagara Falls and was going to Syracuse, we had a hot journey. We had not had anything to eat, and by and by the conductor came through and said, so many minutes for refreshments. I waited anxiously on account of my appetite, because it is always with me, and when we went into the lunch room and sat down, a beautiful young lady came to wait upon me. I said I would have a couple of soft boiled eggs, and she brought them on. I took my knife and hit one and cracked it, and I said, "What is that?" She said, "That is an egg." She said, "You must not find fault with me; we do not control conditions." I said, "I do not find any fault with you, I like you, but that has been an egg too long." And she acknowledged it. You see that is the trouble. The farmers of to-day will find fault because they do not get a large price for their eggs, and then say there is no money in the business. How do they know that there is no money in the business if they haven't good eggs to put on the market? Sometimes people say, "You have got your name up." It is the easiest thing in the world to get your name up if you have the eggs. Boys, don't ever say you can't; say you will try, and if you do not succeed the first time, try again. I tell you it is this stick-to-itiveness that wins, every time. Tell me who a boy's associates are, and, as I rule, I can tell you the destiny of that boy. Have you ever thought of it? Have you ever noticed particularly whom your boys were coming in contact with, if they are well bred, if they are well behaved, if they love their fathers and mothers and their homes? When boys go to the bad it is just the bad associations. How I have pitied the boys that I have known so well, whose parents were wealthy. An easy pathway always makes a weak man; have you noticed it? Take the boys in our



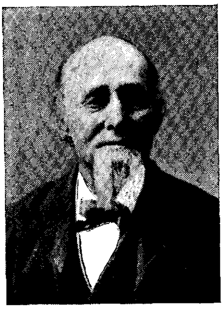
A. J. C. C. BULL, EARL OF BRONDALE, 33,618.
Property of Jonathan Benn, Hodgdon.

own State whose parents have become wealthy, and who have been bred in luxury, and the moment they stand upon their own feet they have no stamina and they drop, and the farms that their fathers worked so hard to pay for, and the money they put into the banks to care for their children after they have passed over the stream is squandered and wasted. Farmers, when you go to your homes and think what has been said and what has been done at this meeting, talk it over with your boys and with your families. Talk the thing over in a social way, and respect the opinion of your children, and encourage them, and in that way you will be more likely to succeed. I hear that the State Fair is held right here, and there you have a glorious opportunity. Now go to work, and if you have no thoroughbreds just weed out your old scrubs, and get yourself a good sire and fit yourself for the show arena. Get on your feet, feel proud of your business, and the people will feel proud of you. It has been my pleasure for the past twenty years to be in the different show arenas as judge of cattle, and I want to say to you that a boy will take more comfort in feeding some little thing for the coming fair than you would think. It will occupy him at home, and if he is going to school he will spend his spare hours putting on the finish, and seeing it grow, and this will interest him more than anything you can do for that boy. One thing in connection with fairs—you must demand of the man that judges your stock, when he goes into that show arena, that he tell you why he puts a premium on such an individual, and give an explanatory talk, and then you go from that fair educated. I have seen people judging at different fairs in the different states who would simply button up their coats and look very wise and say, I will give that animal the first premium and that one the second, and if a farmer stands bv and asks any questions, they will say, "It is none of your business." I tell you that ought to be beneath the dignity of any man. It is an educational matter. Every time you go to a fair there is a lesson in that fair if judges are secured that are competent, and that is what should be done.

I am glad that I am here to-night. I am actually glad of this opportunity. I came here with the least bit of reluctance, because I was a total stranger to you, but I know this—that you are earnest in spirit, honest in heart, and willing to accept the knowledge of the truth as it comes to you. You have my best wishes. We can see the golden sunbeam's gilding, it is shedding its effulgent rays from ocean to ocean. Let us throw envy and jealousy out of the windows of our hearts and allow the glorious prosperity to come in. Then, and only then, will God bless us financially.

LESSONS TO BE LEARNED FROM THE INTER-STATE DAIRY CONFERENCE AT PORTLAND.

By Hon. R. W. Ellis, Embden.



R W Ellis

One year ago we met our dairy friends from Vermont, New Hampshire, and some from Massachusetts, at Portland, and had a very enjoyable time. We found them to be a very fine class of people, and from our short acquaintance with them, think we got many useful ideas, and upon the lessons to be learned from that meeting I shall speak very briefly this evening.

The first lesson we learn is how little reliance can be placed upon the butter scores at our state dairy meetings as indicating the relative quality of the butter of the different states or of individuals when the makers are known. It must be pretty thoroughly proven to any one who has given the matter any thought, that the taste is entirely subservient to the will, and the will may be governed, unconsciously, by outside circumstances and conditions. For instance, when an expert comes to a package of butter made by some noted person up in Vermont, particularly nice, where rich flavor precedes the butter in his mouth, it "gits there fust," as David Harum would say, and it holds possession, but when he comes to a package of Maine butter, up comes the "Boston Price Current" in his mind, "Maine butter two or three cents lower." Down goes the score two or three points. We all know instances in our own state, also in Vermont and New Hampshire, where noted butter makers, who had usually carried off first honors with scores up among the sevens and eights, when they came down to Portland, where their butter was not surrounded by that "halo" with which it was at home, received scores which came down with the rest of us mortals, ninety to ninety-three points. I have talked with these Boston experts about the standing of our butter in Boston market, and asked them if they did not think the difference was more imaginary than real. They would say, "It may be, to some extent, but there is no question but that there is a peculiarly rich flavor in the Vermont butter, not found in Maine butter. It might not be detected by an ordinary person, but an expert can detect it at once." When they were invited by our secretary of the Board of Agriculture to come down to Portland and meet us in a friendly contest, they accepted with alacrity, and came down in goodly numbers, not exactly with the same feeling, perhaps, that Goliath went out to meet David, but with a pretty strong assurance that the only question would be as to how much they should beat us; and why should they not feel that way? They have been told by every expert for years that they were from two to four points ahead of us. Mr. Douglass was selected to make the awards, a man who has the reputation of being the best judge of butter in all New England, if not the United States, but who is a Boston butter dealer and of course has his preference for Vermont and New Hampshire butter, but here he was completely hedged about. He had no possible way of knowing whose butter he was scoring, where it came from or whether it was creamery or dairy. Well, he went at it manfully, and examined the whole lot, over 100 packages, and when he found one exceptionally fine, he set it aside for a cross-examination, and I think he had some twelve or fifteen of these extra nice specimens, and after dinner he went at the cross-examination (with the help of Mr. White, I am told). This must have been a trying time for them, for they had both declared, over and over again, that Vermont and New Hampshire were both ahead of Maine, and now their reputation was at stake. What would they have given for one ray of light as to where the butter came from, but there were only the numbers and they would not speak, so they had to make a leap in the dark, with nothing but their taste to guide them, and when the books were opened, they found the first honors had gone to A. J. Abbott, North Paris, Me.; 2d, to Frank W. Blanchard, Cumberland Center, Me., and with scores of 96¾ and 96; 3d, divided between C. E. Sherburne, North Pomfret, Vt., and G. M. Gowell, Orono, Me., 95½ points. Now the dairymen of Maine don't propose to put on any airs, but we do claim that hereafter we shall be allowed as the equals of any other New England State.

But when we come to the creamery class, Maine does not stand as well, although Skowhegan creamery scored as high as any in Vermont or New Hampshire, excepting one, 96 points, but on the average we are away below. Vermont made a wonderful showing, seventeen creameries, averaging 94½ points. Now here is a lesson for Maine dairymen to study to their advantage, if they will. With all the natural advantages for making a superior butter, as we have just demonstrated in the dairy class, why should we fall so far behind in the creamery class? The reason is very obvious. They have long been in the business, they have found out there is money in it, they are united and enthusiastic. All, or nearly all, in the locality of a factory, stock their farms with cows to their full capacity, keeping from twenty to fifty to a farm. They carry their milk to the factory every morning and carry home their skimmed milk. The milk is run through a separator, the cream is put through the proper process, is made into the finest article of butter and is put into the Boston market in three days from the time the milk is drawn from the cow. Of course it brings the top price and as the cost of making and marketing is from two to three cents per pound, it generally nets the farmers from twenty-two to twenty-three cents average for the year. Do you wonder they are contented and happy to come down here and make the showing they do?

Now we have all the natural advantages they have. We have a very few factories in our State working on much the same plan of theirs, but a large majority of them are run very differently. Take our county of Somerset for example; it is not a dairy county. Fat stock and sheep predominate, with quite a sprinkling of horse raising. When the stock business went down a few years ago, they turned their attention to dairying somewhat, and four factories were built and are now running, but at a poor, half dying rate. Since the revival of the beef business, many have gone back into their old business again. Now we have first-class farms within a radius of five miles of either of these factories sufficient to run them in as good shape as any Vermont factory is run, but a majority of these farmers are in other kinds of business, and their cream gatherers have to travel long distances and get but little cream, so it makes it very expensive, and they go but twice or three times a week, so cannot make a first-class article of butter; and of course it cannot bring first price, so the farmer gets small pay for his cream and the manufacturer is not making much money if he is honest with his patrons.

You may say I am not making very good talk to encourage dairying. Perhaps not, but a trouble must be seen before it will be remedied. I don't believe in pushing dairying to the front in localities where other lines of farming predominate, and I believe it would be better for the real dairymen in these localities to pull out from the factories and manufacture their own or where there are several in close proximity, pool in together and make a first-class article of dairy butter at small expense and which would bring top price, than to pay the high price they have to pay for collecting and making, and sell as second-class creamery butter. Where dairying predominates, I believe in doing all we can to encourage those in it to do more and better work, and thereby encourage those in other lines to come in with them, for the more cows kept on a given area of territory, the less the cost of making and the better the article made, so they gain a double advantage. I believe in the coöperative rather than the proprietary method of doing the business. There is not so much chance for fault finding, and where each one owns a share and has a voice in the management, he is more interested to do the best he can himself and see that others do the same, to the end that the best article of butter is made at the smallest cost.

Now let me repeat the text I took at Norway a few years ago: What the dairymen of Maine need is more faith in their business and confidence one in another; faith to that extent that they will put all their energy, might, mind and strength into it, keeping every cow possible and caring for them and their product in such a manner as to get all possible out of them; confidence in each other to that extent that we are willing to coöperate in making, marketing and all the management of the business, and always be willing to help one another, feeling that in so doing we are helping ourselves and increasing the happiness of all.

J. A. ROBERTS.

We have seen in the remarks that have been made by various speakers in our own State, to-day, the importance of the industry which is represented by this meeting. With 150,000 cows, representing a capital of many millions of dollars, employing many thousands of our people and producing a product that must mount well up towards ten millions of dollars—such an industry is worth fostering, is worth developing. I believe my friend, Mr. Ellis, has hit the nail on the head when he says that we should have more faith in this business, in a word, that we should acquire a dairy spirit. We are proud of our State; we are proud of the men who have gone from it, we are proud of the men who have remained here and developed great industries. We are glad to have these cotton mills, these shoe factories, these large pulp mills and lumber mills. They bring in lots of money, they are developing our resources. But these dairymen, scattered from one side of the State to the other, are engaged in an employment that is equally entitled to development, with the large manufacturing establishments.

OFFICERS OF AGRICULTURAL SOCIETIES.

Name of Society.	President.	P. O. Address.	Secretary.	P. O. Address.	Treasurer.	P. O. Address.
Maine State Agricultural	I. Pompilly	Auburn	George H. Clarke	North Anson	E. G. Eveleth	Auburn.
Eastern Maine Fair Association	F. O. Beal	Bangor	Ezra L. Sterns	Bangor	S. Dean Benson	Bangor.
Maine State Pomological	W. M. Munson	Orono	Chas. S. Pope	Manchester	Chas. S. Pope	Manchester.
Androscoggin County	R. C. Boothby	Livermore Falls	J. L. Lowell	Auburn	Edwin Riley	Livermore Falls.
Androscoggin, Durham	A. G. Fitz	Durham	F. H. Miller	West Durham	C. H. Bliss	Durham.
Aroostook County	Jonathan Benn	Hodgdon	Ira J. Porter	Houlton	Ira J. Porter	Houlton.
Aroostook, North	J. W. Dudley	Mapleton	E. T. McGlauflin	So. Presque Isle	A. E. Irving	Presque Isle.
Aroostook, South	T. B. Bradford	Golden Ridge	Isaac Cushman	Sherman Mills	B. H. Towle	Sherman Mills.
Aroostook, Madawaska	Rev. Henri Gory	St. Agatha	Remi A. Daigle	St. David	Vilas Cyr	Upper Madawaska.
Cumberland County	Alonzo Libby	Westbrook	C. H. Leighton	Cumberland Mills	F. D. Scammon	Gorham.
Cumberland, North	Q. M. Chute	Harrison	J. Orin Ross	Edes' Falls	James Thomes	Harrison.
Cumberland Farmers' Club	M. W. Pearson	Cumberland Cen.	H. B. Clough	Cumberland Cen.	N. M. Shaw	West Cumberland.
Cumberland Gray Park Association	B. F. Skillings	Gray	J. W. Stevens	Gray	J. W. Stevens	Gray.
Cumberland, Bridgton Farmers' and Mechanics' Association	E. C. Walker	Bridgton	F. C. Knight	Bridgton	C. A. Scribner	Bridgton.
Cumberland, New Gloucester and Danville	A. C. Frank	Auburn	F. W. Berry	New Gloucester	Geo. C. Jordan	Upper Gloucester.
Cumberland, Lake View Park	Arthur Dyer	Sebago	J. P. Fitch	East Sebago	J. P. Fitch	East Sebago.
Franklin County	E. W. Rollins	No. Chesterville	J. J. Hunt	Farmington	Geo. M. Currier	Farmington.
Franklin North	C. W. Carr	Strong	M. S. Kelley	Phillips	S. H. Beal	Phillips.
Hancock County	W. J. Creamer	Penobscot	Nahum Hinckley	Bluehill	M. P. Hinckley	Bluehill.
Hancock North	H. T. Silsby	Aurora	A. W. Silsby	Amherst	A. W. Silsby	Amherst.
Hancock County Fair Association	A. W. Ellis	Ellsworth	H. F. Whitcomb	Ellsworth	H. J. Joy	Ellsworth.
Hancock, Eden	W. L. Alley	Eden	F. A. Wood	Salisbury Cove	J. E. Hamor	West Eden.
Kennebec County	E. H. Kent	Fayette Corner	W. G. Hunton	Readfield	C. H. Stevens	Readfield.
Kennebec South	L. A. Howe	Windsor	A. N. Douglass	Chelsea	J. S. Gray	South Windsor.
Kennebec, Pittston Agricultural and Trotting Park Association	John H. Bailey	East Pittston	Fred C. Hanley	East Pittston	W. E. Seekins	East Pittston.
Knox, North	E. E. Thurston	Union	Geo. C. Hawes	Union	H. W. Grinnell	Union.
Lincoln County	A. M. Card	Alna	B. A. Woodbridge	North Newcastle	John E. Nelson	Alna.
Lincoln, Bristol	G. A. Huston	Damariscotta	A. C. Fossett	Pemaquid	C. B. Woodward	Damariscotta.
Oxford County	W. J. Wheeler	South Paris	A. C. T. King	South Paris	A. C. T. King	South Paris.
Oxford, Riverside Park Association	C. M. Wormell	Bethel	E. S. Kilborn	Bethel	E. C. Rowe	Bethel.
Oxford, West	D. A. Ballard	Fryeburg	T. L. Eastman	Fryeburg	W. R. Tarbox	Fryeburg
Oxford Androscoggin Valley	J. W. Thompson	Canton	H. T. Tirrell	Canton	D. W. Goding	East Peru.
Oxford, North	Geo. O. Huse	Andover	John F. Talbot	Andover	Lewis C. Akers	Andover.
Penobscot County	Charles Sutton	Stillwater	Geo. N. Holland	Hampden	H. W. Hammond	Hampden.
Penobscot Lee Union						

Penobscot, West	Joel Richardson	North Newport	F. E. Jewett	Exeter	F. E. Jewett	Exeter.
Penobscot, North	S. T. Mallett	South Springfield	B. D. Averill	Prentiss	E. A. Reed	North Lee.
Penobscot, East Eddington Farmers' Club	A. H. Pond	East Eddington	E. B. Comins	East Eddington	J. H. Comins	East Eddington.
Penobscot, Orrington	A. G. Dole	South Brewer	N. A. Nickerson	Orrington	N. A. Nickerson	Orrington.
Piscataquis, East	W. H. Snow	Milo	A. L. Ward	Milo	A. L. Ward	Milo.
Piscataquis, West	J. F. Sprague	Monson	W. A. Bray	Monson	W. A. Bray	Monson.
Sagadahoc County	B. M. Patten	Topsham	W. S. Rogers	Topsham	L. E. Smith	Brunswick.
Sagadahoc, Richmond Farmers' and Mechanics' Club	F. J. Libby	Richmond	C. E. Dinslow	Richmond Cor	D. W. Alexander	Richmond.
Somerset County	O. Walker	Anson	J. F. Withee	Madison	C. A. Wilbur	Madison.
Somerset, East	J. S. Page	Hartland	J. A. Goodrich	Hartland	Charles Rowell	Hartland.
Somerset, Central	R. B. Shepherd	Skowhegan	H. A. Archer	Skowhegan	A. R. Bixby	Skowhegan.
Somerset, New Portland	W. R. Richardson	No. New Portland	W. B. Clark	No. New Portland	Elmer Quint	No. New Portland.
Waldo County	Joseph Ellis	South Brooks	G. G. Abbott	Belfast	G. G. Abbott	Belfast.
Waldo and Penobscot	M. C. Chapman	Newburg Village.	F. H. Bowden	Monroe	F. L. Palmer	Monroe.
Waldo, West	L. C. Morse	Liberty	Wm. H. Moody	Liberty	L. F. Hurd	Liberty.
Waldo, North	Edwin Rand	Unity	E. B. Hunt	Unity	F. A. Bartlett	Unity.
Washington County	P. A. Rich	Charlotte	Sidney A. Wilder.	West Pembroke	Clifton Laughlin.	Pembroke.
Washington, North	Charles H. Yates.	Princeton	Albert L. Jones	Princeton	Nathaniel Ripley.	Princeton.
Washington, West	D. W. Campbell	Cherryfield	E. F. Allen	Columbia Falls	F. L. Allen	Columbia Falls.
Washington, Central	E. J. Vose	Machias	E. F. Barry	Machias	M. Gardner	Machias.
York County	......	......	......	......	......	......
York, Buxton and Hollis	......	......	......	......	......	......
York, Ramshackle Park	L. O. Straw	Newfield	E. E. Goodwin	Woodman, N. H.	Ira H. Moore	Newfield.
York, Shapleigh and Acton	G. W. Grant	Acton	F. K. Bodwell	Acton	W. P. Ferguson	Springvale.
York, Ossipee Valley Union	R. G. Pease	Cornish	H. Lorin Merrill	East Parsonsfield	O. B. Churchill	North Parsonsfield.
York, Springvale Agricultural and Mechanical Association	......	......	......	......	......	......
York, North Berwick Agricultural Association	Nathaniel Hobbs.	North Berwick	Geo. W. Perkins	North Berwick	John B. Russell	North Berwick.

ANALYSIS OF EXHIBITION.

Name of Society.	Number of horses and colts.	Number of thoroughbred bulls and bull calves.	Number of thoroughbred cows, heifers and heifer calves.	Number of grade bulls and bull calves.	Number of grade cows, heifers and heifer calves.	Number of oxen and steers.	Number of animals for beef.	Number of cattle shown in herds.	Total number of neat stock.	Number of sheep.	Number of swine.	Number of poultry. (coops).
Androscoggin County	74	22	56	-	60	76	20	48	214	-	16	140
Androscoggin, Durham	21	-	-	6	15	22	6	8	57	28	4	24
Aroostook County	-	-	-	-	-	-	-	-	-	-	-	-
Aroostook, North	98	11	25	16	46	16	-	24	138	25	5	14
Aroostook, South	1	-	-	-	-	-	-	-	-	2	-	-
Aroostook, Madawaska	21	-	-	-	-	6	-	12	18	10	-	-
Cumberland County	43	16	36	-	61	94	21	36	264	47	50	43
Cumberland, North	55	-	-	6	15	80	8	31	140	-	15	15
Cumberland Farmers' Club	11	10	30	1	30	27	7	20	125	24	1	49
Cumberland, Gray Park Association	24	11	23	-	43	72	2	40	151	1	9	13
Cumberland, Bridgton Farmers' and Mechanics' Asso.	27	9	16	2	31	92	7	8	165	25	30	42
Cumberland, New Gloucester and Danville	44	1	-	6	54	16	-	15	92	8	1	40
Cumberland, Lake View Park	28	-	-	-	13	14	-	-	27	-	-	2
Franklin County	49	26	56	23	92	268	10	96	571	311	10	75
Franklin, North	55	8	22	13	28	162	3	36	272	86	10	8
Hancock County	25	4	4	6	39	34	-	-	87	17	-	6
Hancock, North	11	1	8	1	11	8	-	-	29	5	2	17
Hancock County Fair Association	26	6	10	-	20	22	-	-	53	16	3	108
Hancock, Eden	5	1	4	1	3	-	-	-	9	3	9	20
Kennebec County	92	14	35	-	57	104	42	58	310	35	42	65
Kennebec, South	30	11	25	11	29	106	6	25	213	12	-	9
Kennebec, Pittston Agricultural & Trotting Park Asso.	16	8	11	13	53	130	4	19	238	16	13	34
Knox, North	39	5	13	8	45	60	11	72	134	25	23	33
Lincoln County	27	6	12	3	27	136	4	-	188	17	40	29
Lincoln, Bristol	23	-	-	1	8	40	-	-	49	4	-	8

Oxford County	43	33	45	-	115	184	6	36	419	111	61	49
Oxford, Riverside Park Association	75	-	-	10	30	34	20	18	112	21	9	15
Oxford, West	73	12	26	2	13	120	5	22	200	-	18	126
Oxford, Androscoggin Valley	26	14	31	9	19	138	6	22	239	41	79	15
Oxford, North	19	5	12	2	34	18	1	20	81	28	18	26
Penobscot County	-	-	-	-	-	-	-	-	-	-	-	-
Penobscot, Lee Union	-	-	-	-	-	-	-	-	-	-	-	-
Penobscot, West	49	16	56	9	58	58	1	20	218	101	20	28
Penobscot, North	20	4	8	5	40	20	6	20	99	30	10	10
Penobscot, East Eddington Farmers' Club	15	1	-	2	30	4	-	12	37	32	10	16
Penobscot, Orrington	15	-	-	3	10	-	-	-	13	16	-	11
Piscataquis, East	-	-	-	-	-	-	-	-	-	-	-	-
Piscataquis, West	8	2	-	-	6	2	3	-	13	30	-	8
Sagadahoc County	26	35	97	-	88	94	2	-	316	50	20	225
Sagadahoc, Richmond Farmers' and Mechanics' Club	11	8	24	2	32	40	2	71	179	7	-	69
Somerset County	34	9	11	1	72	64	6	-	163	123	7	5
Somerset, East	18	4	1	-	9	6	-	10	20	2	-	-
Somerset, Central	-	-	-	-	-	-	-	-	-	-	-	-
Somerset, New Portland	-	-	-	-	-	-	-	-	-	-	-	-
Waldo County	-	-	-	-	-	-	-	-	-	-	-	-
Waldo and Penobscot	39	27	16	4	42	90	19	64	262	111	3	22
Waldo, West	-	-	-	-	-	-	-	-	-	-	-	-
Waldo, North	18	-	-	7	20	14	-	-	41	45	1	8
Washington County	42	4	17	-	47	14	-	24	106	79	31	46
Washington, North	16	-	-	2	23	-	-	-	25	18	6	7
Washington, West	48	12	15	-	36	20	-	12	95	42	25	64
Washington, Central	-	-	-	-	-	-	-	-	-	-	-	-
York County	-	-	-	-	-	-	-	-	-	-	-	-
York, Buxton and Hollis	-	-	-	-	-	-	-	-	-	-	-	-
York. Ramshackle Park	-	-	-	-	-	-	-	-	-	-	-	-
York, Shapleigh and Acton	10	-	-	4	16	116	8	-	144	9	2	34
York, Ossipee Valley Union	7	5	8	-	16	130	2	6	167	-	7	2
York, Springvale Agricultural and Mechanical Asso.	-	-	-	-	-	-	-	-	-	-	-	-
York, North Berwick Agricultural Association	65	12	30	5	25	86	-	30	188	25	-	-

ANALYSIS OF AWARDS.

Name of Society.	Amount of premiums paid trotting bred stallions.	Amount of premiums paid trotting bred brood mares.	Amount of premiums paid draft stock stallions.	Amount of premiums paid draft stock brood mares.	Amount of premiums paid family horses.	Amount of premiums paid gentlemen's drivers.	Amount of premiums paid matched carriage horses.	Amount of premiums paid colts.	Amount of premiums paid horses for draft.
Androscoggin County	$22 00	$9 00	$10 00	$10 00	$9 00	$10 00	$12 00	$42 00	$20 00
Androscoggin, Durham	-	3 00	-	-	3 00	3 00	-	12 00	9 00
Aroostook County	-	-	-	-	-	-	-	-	-
Aroostook, North	1 50	3 25	2 50	1 50	-	3 25	-	18 00	18 25
Aroostook, South	-	-	-	-	-	-	-	50	-
Aroostook, Madawaska	-	-	75	75	1 50	-	-	2 25	1 50
Cumberland County	23 00	15 00	-	-	20 00	-	-	3 00	32 00
Cumberland, North	-	-	-	5 00	-	-	6 00	6 00	51 00
Cumberland Farmers' Club	-	3 00	-	-	-	10 00	-	6 50	4 00
Cumberland, Gray Park Association	2 00	10 00	-	-	5 00	15 00	5 00	6 50	15 00
Cumberland, Bridgton Farmers' and Mechanics' Association	3 00	-	-	-	6 00	-	9 00	5 00	27 00
Cumberland, New Gloucester and Danville	8 00	-	2 00	3 00	3 00	8 00	5 00	8 00	5 00
Cumberland, Lake View Park	7 00	2 00	-	-	-	6 00	5 00	9 00	20 00
Franklin County	13 00	6 00	-	5 00	-	20 00	16 00	29 25	18 00
Franklin, North	4 00	2 50	-	4 50	4 00	6 00	6 00	6 35	5 00
Hancock County	4 00	1 50	-	6 00	5 00	5 00	2 00	10 00	-
Hancock, North	-	1 50	-	-	3 50	2 25	-	2 50	15 00
Hancock County Fair Association	16 50	12 50	-	-	-	10 00	-	13 00	38 00
Hancock, Eden	-	1 00	-	-	-	-	-	2 00	-
Kennebec County	19 00	17 00	16 50	9 00	9 00	9 00	6 00	18 00	18 00
Kennebec, South	7 75	3 75	-	-	-	-	-	12 15	10 75
Kennebec, Pittston Agricultural and Trotting Park Association	2 00	4 00	-	-	3 00	-	-	7 00	-
Knox, North	5 00	2 00	-	-	3 00	2 50	3 50	7 50	39 00
Lincoln County	5 00	4 50	3 00	3 00	-	-	4 00	9 00	12 00
Lincoln, Bristol	-	-	-	-	-	-	-	-	10 00
Oxford County	48 00	27 00	-	-	-	35 00	-	46 00	69 00
Oxford, Riverside Park Association	6 00	5 00	-	-	-	30 00	-	4 70	38 00
Oxford, West	15 00	7 00	5 00	9 00	7 00	25 00	9 00	14 00	40 00
Oxford, Androscoggin Valley	13 00	9 00	-	-	-	10 00	6 00	15 00	20 00

Oxford, North	4 00	4 50	-	-	-	10 00	-	6 15	30 00
Penobscot County	-	-	-	-	-	-	-	-	-
Penobscot, Lee Union	-	-	-	-	-	-	-	-	-
Penobscot, West.	5 00	-	6 00	5 00	5 00	10 00	5 00	17 00	11 00
Penobscot, North	-	-	1 50	3 00	2 00	3 55	2 00	6 00	5 25
Penobscot, East Eddington Farmers' Club	-	-	-	-	-	2 50	-	3 50	7 00
Penobscot, Orrington	-	-	-	-	-	3 00	-	7 50	5 00
Piscataquis, East	-	-	-	-	-	-	-	-	-
Piscataquis, West	-	-	-	-	-	-	1 00	-	5 00
Sagadahoc County	6 00	8 00	-	-	3 00	10 00	-	21 00	28 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	75	75	-	75	90	-	-	1 75	8 25
Somerset County	2 00	3 00	-	-	3 00	3 50	3 00	7 00	11 00
Somerset, East	4 00	4 00	-	-	-	4 50	3 50	4 00	100 00
Somerset, Central	-	-	-	-	-	-	-	-	-
Somerset, New Portland	-	-	-	-	-	-	-	-	-
Waldo County	-	-	-	-	-	-	-	-	-
Waldo and Penobscot	20 00	6 00	6 00	-	10 00	10 00	-	42 00	32 00
Waldo, West	-	-	-	-	-	-	-	-	-
Waldo, North	12 00	6 00	-	5 00	6 00	12 00	6 00	13 50	5 00
Washington County	10 00	12 00	6 00	5 00	-	-	12 00	27 00	21 00
Washington, North	3 00	3 00	-	3 00	-	-	-	6 00	3 00
Washington, West	16 00	4 00	-	4 00	-	65 00	2 00	28 00	52 00
Washington, Central	-	-	-	-	-	-	-	-	-
York County	-	-	-	-	-	-	-	-	-
York, Buxton and Hollis	-	-	-	-	-	-	-	-	-
York, Ramshackle Park	-	-	-	-	-	-	-	-	-
York, Shapleigh and Acton	-	-	-	-	6 00	6 00	-	-	-
York, Ossipee Valley Union	5 00	5 00	-	-	-	3 00	-	11 00	-
York, Springvale Agricultural and Mechanical Association	-	-	-	-	-	-	-	-	-
York, North Berwick Agricultural Association	-	-	-	-	3 00	-	-	3 00	-

ANALYSIS OF AWARDS—Continued.

Name of Society.	Amount of premiums paid thoroughbred bulls and bull calves.	Amount of premiums paid thoroughbred cows, heifers and heifer calves.	Amount of premiums paid grade bulls and bull calves.	Amount of premiums paid grade cows, heifers and heifer calves.	Amount of premiums paid herds.	Amount of premiums paid working oxen and steers.	Amount of premiums paid matched oxen and steers.	Amount of premiums paid trained steers.	Amount of premiums paid beef cattle.	Amount of premiums paid town teams.	Amount of premiums paid oxen and steers for draft.
Androscoggin County	$86 00	$78 00	-	$94 00	$20 00	$14 00	$35 00	$6 00	$16 00	$84 00	$45 00
Androscoggin, Durham	-	-	$5 75	19 00	6 00	-	6 00	12 00	6 00	-	18 00
Aroostook County	-	-	-	-	-	-	-	-	-	-	-
Aroostook, North	21 50	35 50	13 25	18 25	15 00	-	11 50	-	-	-	-
Aroostook, South	-	-	-	-	-	-	-	-	-	-	-
Aroostook, Madawaska	-	-	-	4 70	-	75	.	-	-	-	-
Cumberland County	18 00	64 00	-	42 00	36 00	12 00	30 00	15 00	36 00	14 00	97 00
Cumberland, North	-	-	15 00	7 50	25 00	6 00	23 50	17 50	6 00	10 00	48 00
Cumberland Farmers' Club	18 00	22 65	2 00	19 00	26 00	29 00	5 00	-	9 00	28 00	15 00
Cumberland, Gray Park Association	14 50	18 50	-	38 50	16 00	5 00	14 00	-	3 00	33 00	11 00
Cumberland, Bridgton Farmers' and Mechanics' Asso	28 00	51 00	-	21 00	4 00	9 00	45 50	6 00	8 50	32 00	58 00
Cumberland, New Gloucester and Danville	3 00	-	6 00	31 00	10 00	2 00	5 00	-	-	10 00	-
Cumberland, Lake View Park	-	-	-	12 00	-	6 00	-	-	-	-	8 00
Franklin County	42 50	55 25	21 00	67 50	41 00	13 00	85 00	7 00	13 00	85 00	40 00
Franklin, North	7 15	15 10	7 50	10 30	15 00	2 00	10 25	1 50	1 00	30 88	6 25
Hancock County	17 00	7 00	9 00	47 75	-	19 00	7 00	-	10 50	5 00	33 00
Hancock, North	1 00	5 50	50	7 50	-	-	4 25	-	-	-	-
Hancock County Fair Association	18 30	21 10	-	37 50	-	36 60	-	7 00	-	-	32 00
Hancock, Eden	1 50	5 50	1 50	4 50	-	-	-	-	-	-	-
Kennebec County	32 00	30 50	-	34 50	21 00	33 00	14 00	10 00	24 00	63 00	-
Kennebec, South	16 50	32 00	14 25	34 05	19 25	19 25	22 00	2 00	5 00	42 00	23 00
Kennebec, Pittston Agricultural & Trotting Park Asso	9 00	10 00	9 50	16 50	3 00	13 75	12 00	3 00	5 00	35 00	24 00
Knox, North	7 50	8 50	6 50	25 00	12 00	6 75	6 50	-	6 00	15 00	16 00
Lincoln County	9 00	17 50	6 00	17 00	4 00	9 00	20 00	23 50	6 00	22 00	4 00
Lincoln, Bristol	-	-	-	11 50	-	-	-	-	-	-	11 50

Oxford County	161 00	134 00	-	171 00	36 00	139 00	48 00	-	12 00	90 00	57
Oxford, Riverside Park Association	-	4 50	9 50	65 00	8 00	28 25	9 75	1 50	-	24 00	18 00
Oxford, West	26 00	71 00	4 00	18 50	16 00	18 00	35 00	7 00	12 00	74 00	69 00
Oxford, Androscoggin Valley	35 00	30 50	14 00	19 00	15 00	26 00	33 00	5 00	6 00	13 00	38 00
Oxford, North	11 50	8 60	-	8 40	8 50	-	16 75	3 75	-	-	-
Penobscot County	-	-	-	-	-	-	-	-	-	-	-
Penobscot, Lee Union	-	-	-	-	-	-	-	-	-	-	-
Penobscot, West	37 00	64 25	14 25	66 25	12 00	15 00	10 00	3 00	2 00	-	17 00
Penobscot, North	5 00	5 00	5 00	15 00	5 00	2 00	-	-	-	-	2 00
Penobscot, East Eddington Farmers' Club	2 00	-	1 00	9 50	9 00	-	-	-	-	-	3 00
Penobscot, Orrington	-	-	2 00	5 25	-	-	-	-	-	5 00	-
Piscataquis, East	-	-	-	-	-	-	-	-	-	-	-
Piscataquis, West	2 00	1 00	-	1 00	-	-	-	-	-	-	-
Sagadahoc County	90 00	167 00	-	122 75	54 00	48 50	16 00	8 00	5 00	40 00	75 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	3 50	6 25	-	8 70	5 75	3 15	3 40	55	60	-	3 00
Somerset County	6 50	5 75	1 00	36 00	-	9 50	7 50	-	3 00	21 00	11 00
Somerset, East	7 00	1 25	-	9 25	4 00	5 50	-	-	-	-	-
Somerset, Central	-	-	-	-	-	-	-	-	-	-	-
Somerset, New Portland	-	-	-	-	-	-	-	-	-	-	-
Waldo County	-	-	-	-	-	-	-	-	-	-	-
Waldo and Penobscot	97 00	71 00	10 00	90 00	52 00	35 00	10 00	10 00	56 00	20 00	42 00
Waldo, West	-	-	-	-	-	-	-	-	-	-	-
Waldo, North	-	-	15 00	16 00	-	-	27 00	-	7 00	-	-
Washington County	9 00	19 50	-	25 00	26 00	19 50	-	-	-	-	-
Washington, North	-	-	3 50	20 00	-	-	-	-	-	-	-
Washington, West	56 00	29 00	-	68 00	14 00	41 00	-	5 00	-	-	-
Washington, Central	-	-	-	-	-	-	-	-	-	-	-
York County	-	-	-	-	-	-	-	-	-	-	-
York, Buxton and Hollis	-	-	-	-	-	-	-	-	-	-	-
York, Ramshackle Park	-	-	-	-	-	-	-	-	-	-	-
York, Shapleigh and Acton	-	-	5 50	13 00	-	6 00	26 50	-	6 00	45 00	12 00
York, Ossipee Valley Union	17 00	21 00	-	7 00	8 00	-	13 00	5 00	5 00	22 00	58 00
York, Springvale Agricultural & Mechanical Association	-	-	-	-	-	-	-	-	-	-	-
York, North Berwick Agricultural Association	10 00	25 00	15 00	15 00	20 00	-	5 00	-	-	20 00	10 00

ANALYSIS OF AWARDS—Concluded.

Name of Society.	Amount of premiums paid sheep.	Amount of premiums paid swine.	Amount of premiums paid poultry.	Amount of premiums paid grain and root crops.	Amount of premiums paid fruit and flowers.	Amount of premiums paid bread and dairy products.	Amount of premiums paid honey, sugar and syrups.	Amount of premiums paid agricultural implements.	Amount of premiums paid household manufactures and needle work.	Amount of premiums paid objects not named above.	Total amount of premiums and gratuities paid.
Androscoggin County	-	$14 00	$116 00	$77 00	$68 00	$35 00	$13 00	$5 00	$97 00	$217 00	$1,264 00
Androscoggin, Durham	$13 00	6 50	10 50	25 15	15 90	4 55	7 90	-	23 75	14 00	224 00
Aroostook County	-	-	-	-	-	-	-	-	-	-	-
Aroostook, North	18 50	10 00	13 00	51 70	51 30	17 30	4 75	-	24 50	54 96	409 26
Aroostook, South	38	-	-	3 89	1 25	1 38	1 26	-	4 65	-	13 31
Aroostook, Madawaska	2 90	-	-	6 50	-	-	-	-	2 95	1 75	26 30
Cumberland County	29 00	12 00	55 00	17 00	41 00	24 00	27 00	2 00	55 00	51 75	770 75
Cumberland, North	-	5 00	12 50	13 75	10 75	5 00	-	1 00	9 70	24 00	308 20
Cumberland Farmers' Club	9 00	1 00	22 25	29 75	26 60	18 35	-	-	28 00	6 50	338 60
Cumberland Gray Park Association	1 00	2 00	7 00	9 50	7 55	10 45	2 50	-	18 25	7 00	277 25
Cumberland, Bridgton Farmers' and Mechanics' Association	20 00	12 00	40 75	23 25	-	13 00	-	4 00	27 25	12 70	465 95
Cumberland, New Gloucester and Danville	2 00	2 00	17 25	8 80	17 00	11 45	-	-	28 50	3 75	199 75
Cumberland, Lake View Park	-	-	50	8 75	9 75	4 50	-	-	7 10	-	105 60
Franklin County	165 00	10 50	59 80	10 00	38 15	18 25	2 55	2 00	60 20	-	943 95
Franklin, North	17 50	2 00	2 00	15 75	11 50	3 65	9 05	-	22 45	5 55	234 73
Hancock County	15 00	-	6 00	66 05	21 90	10 75	3 35	-	33 00	-	344 80
Hancock, North	1 25	2 00	3 75	30 15	20 45	4 75	60	-	26 10	9 00	141 55
Hancock County Fair Association	18 00	5 00	51 25	56 25	34 00	19 75	-	-	83 50	-	510 25
Hancock, Eden	-	2 25	4 50	27 50	8 10	-	1 10	-	7 90	-	67 35
Kennebec County	30 00	18 00	36 00	103 00	84 50	34 75	9 00	-	90 75	5 10	794 60
Kennebec, South	5 00	-	3 05	16 05	22 95	13 15	7 45	-	41 85	9 86	383 06
Kennebec, Pittston Agricultural and Trotting Park Association	4 00	4 00	13 25	6 75	22 40	-	4 20	-	26 20	-	237 55
Knox, North	6 00	5 00	22 30	18 15	19 45	8 50	7 40	-	29 35	21 57	309 97

Lincoln County	8 50	5 00	25 00	45 50	25 15	12 50	2 75	25	40 75	12 00	355 90
Lincoln, Bristol	-	-	5 25	20 00	2 00	3 75	-	-	34 50	3 50	102 00
Oxford County	82 00	35 00	15 40	50 50	48 75	64 50	13 75	41 00	44 45	280 90	1,749 25
Oxford, Riverside Park Association	12 00	10 50	10 50	13 25	10 75	9 65	2 50	-	26 00	71 00	418 35
Oxford, West	-	30 00	89 25	26 25	12 50	22 25	13 50	4 00	32 80	21 75	733 80
Oxford, Androscoggin Valley	20 00	13 50	6 40	11 10	21 85	14 00	3 00	8 00	12 60	41 25	459 20
Oxford, North	15 25	10 75	30 00	15 20	8 60	10 00	5 60	-	35 25	11 20	254 00
Penobscot County	-	-	-	-	-	-	-	-	-	-	-
Penobscot, Lee Union	-	-	-	-	-	-	-	-	-	-	-
Penobscot, West	34 00	24 00	16 00	17 60	25 70	24 25	-	-	95 80	-	542 10
Penobscot, North	4 00	2 00	8 20	4 65	6 50	8 25	50	-	13 40	4 50	114 30
Penobscot, East Eddington Farmers' Club	6 75	3 00	5 00	24 70	17 55	3 50	3 25	-	8 05	7 50	116 80
Penobscot, Orrington	4 50	-	5 00	24 95	22 20	3 25	1 65	-	25 25	9 50	124 05
Piscataquis, East	-	-	-	-	-	-	-	-	-	-	-
Piscataquis, West	2 50	-	1 25	9 30	1 00	-	-	-	25	-	24 30
Sagadahoc County	21 50	15 00	131 25	99 50	99 00	52 50	24 50	-	79 75	219 28	1,444 53
Sagadahoc, Richmond Farmers' and Mechanics' Club	1 15	-	18 80	12 00	4 85	1 90	40	-	11 50	3 00	101 65
Somerset County	35 25	5 00	1 55	5 20	1 50	1 00	50	-	7 85	1 00	192 60
Somerset, East	2 25	-	-	-	-	-	-	-	-	-	149 25
Somerset, Central	-	-	-	-	-	-	-	-	-	-	-
Somerset, New Portland	-	-	-	-	-	-	-	-	-	-	-
Waldo County	-	-	-	-	-	-	-	-	-	-	-
Waldo and Penobscot	84 00	11 00	14 00	40 75	48 00	27 00	2 00	-	142 60	6 25	994 60
Waldo, West	-	-	-	-	-	-	-	-	-	-	-
Waldo, North	58 50	1 00	4 75	16 75	4 75	12 00	21 17	-	29 00	1 00	279 42
Washington County	33 50	15 00	28 50	70 75	23 75	20 50	1 00	-	57 45	6 00	448 45
Washington, North	5 50	2 00	3 25	22 75	10 50	5 00	-	-	25 00	-	115 50
Washington, West	46 00	19 00	38 50	126 50	75 20	26 00	3 25	-	118 65	51 20	888 30
Washington, Central	-	-	-	-	-	-	-	-	-	-	-
York County	-	-	-	-	-	-	-	-	-	-	-
York, Buxton and Hollis	-	-	-	-	-	-	-	-	-	-	-
York, Ramshackle Park	-	-	-	-	-	-	-	-	-	-	-
York, Shapleigh and Acton	5 00	2 50	20 50	53 50	30 00	15 00	5 00	-	30 00	76 50	364 00
York, Ossipee Valley Union	-	4 00	2 00	17 00	8 25	3 50	25	-	30 35	15 00	260 35
York, Springvale Agricultural and Mechanical Association	-	-	-	-	-	-	-	-	-	-	-
York, North Berwick Agricultural Association	15 00	-	-	21 50	8 00	3 00	-	-	32 75	24 65	230 90

FINANCES.

Name of Society.	Amount received from the State.	Receipts for membership.	Receipts from loans.	Receipts from entry fees for trotting purses.	Receipts from all other sources.	Total receipts.	Amount expended in improvements.	Amount expended in trotting purses.	Expenses during the fair.	Amount expended for all other purposes.	Total amount paid out including premiums and gratuities.	Value of property belonging to the society.	Amount of liabilities.
Androscoggin County	$464 63	$42 00	$500 00	$380 00	$1,251 37	$2,638 00	-	$850 00	$516 25	-	$2,630 25	$600 00	$1,100 00
Androscoggin, Durham	45 59	-	-	79 12	358 05	482 76	$50 00	228 00	77 03	$34 09	613 12	2,000 00	1,400 00
Aroostook County	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroostook, North	134 00	57 00	-	180 00	1,557 18	1,928 18	-	475 00	349 00	547 18	1,780 44	4,000 00	2,800 00
Aroostook, South	-	14 00	-	-	-	14 00	-	-	68	-	13 99	-	-
Aroostook, Madawaska	-	34 00	-	-	-	34 00	-	-	-	-	26 30	-	-
Cumberland County	425 17	40 00	150 00	705 00	3,421 31	4,741 48	854 43	1,563 75	1,131 30	386 52	4,706 75	6,500 00	1,200 00
Cumberland, North	79 60	-	-	39 00	346 40	465 00	60 00	130 00	97 91	-	596 11	2,500 00	134 63
Cumberland Farmers' Club	108 14	20 00	-	151 25	785 87	1,065 26	114 91	334 25	272 06	-	1,059 82	3,000 00	350 00
Cumberland, Gray Park Association	92 72	-	-	273 75	1,189 25	1,555 72	45 67	675 00	498 45	-	1,496 37	9,000 00	-
Cumberland, Bridgton Farmers' and Mechanics' Association	105 89	90 00	-	255 00	1,455 03	1,905 92	-	832 00	185 80	386 33	1,870 08	2,500 00	-
Cumberland, New Gloucester and Danville	80 31	-	-	142 25	706 11	928 67	139 76	300 00	79 00	92 90	811 41	2,500 00	-
Cumberland, Lake View Park	50 65	-	-	41 00	368 00	459 65	90 00	173 00	80 66	39 37	488 63	1,000 00	105 00
Franklin County	309 94	739 00	-	442 50	2,403 75	3,895 19	518 77	1,084 00	1,196 74	357 50	4,100 96	10,000 00	-
Franklin, North	98 40	314 00	100 00	67 50	391 19	971 09	55 00	200 00	100 00	222 57	812 30	3,662 84	2,316 00
Hancock County	129 79	-	-	198 00	1,081 28	1,409 07	-	449 00	473 21	-	1,267 01	5,000 00	400 00
Hancock, North	54 59	-	26 86	-	420 08	501 53	101 77	-	191 30	66 91	501 53	100 00	26 86
Hancock County Fair Association	168 15	-	-	93 75	2,316 87	2,578 77	227 60	648 70	782 62	409 60	2,578 77	11,500 00	600 00
Hancock, Eden	13 29	8 00	-	-	874 73	896 02	571 59	-	172 35	86 25	897 54	1,004 00	214 00
Kennebec County	291 48	2 00	-	255 00	1,574 35	2,122 83	210 35	650 00	419 50	103 24	2,177 69	3,500 00	1,000 00
Kennebec, South	127 94	10 00	-	123 75	1,669 41	1,931 10	686 76	463 75	324 89	407 83	2,266 29	2,400 00	-
Kennebec, Pittston Agricultural and Trotting Park Association	93 79	-	-	43 75	1,209 46	1,347 00	150 00	650 00	160 00	149 45	1,347 00	1,600 00	1,175 00
Knox, North	117 79	283 62	-	46 50	769 20	1,217 11	-	199 50	417 24	162 72	1,089 43	-	-

Lincoln County	133 47	17 00	-	17 50	958 72	1,126 69	66 45	246 00	109 55	361 96	1,139 86	1,800 00	-
Lincoln, Bristol	-	19 25	-	-	314 99	334 24	202 80	-	72 60	-	377 40	1,000 00	170 00
Oxford County	615 30	25 00	-	378 75	4,041 00	5,060 05	100 00	976 25	456 61	2,213 89	5,496 00	10,000 00	-
Oxford, Riverside Park Association	244 05	10 00	-	143 82	718 65	1,116 52	175 00	460 00	205 28	-	1,258 63	1,200 00	100 00
Oxford, West	255 90	35 00	138 35	372 50	2,200 65	3,002 40	591 87	850 00	232 50	79 20	2,487 37	7,800 00	1,000 00
Oxford, Androscoggin Valley	179 28	10 00	-	471 25	1,835 18	2,495 71	250 00	1,000 00	247 86	245 78	2,202 84	2,500 00	2,920 00
Oxford, North	103 90	10 00	75 00	84 50	560 60	834 00	120 00	236 25	75 00	302 75	988 00	1,500 00	-
Penobscot County	-	-	-	-	-	-	-	-	-	-	-	-	-
Penobscot, Lee Union	-	-	-	-	-	-	-	-	-	-	-	-	-
Penobscot, West	276 34	-	-	337 50	1,718 17	2,332 01	350 00	762 50	650 00	27 41	2,332 01	6,000 00	3,215 85
Penobscot North	67 92	4 50	-	1 00	57 21	130 63	12 00	4 50	15 00	2 00	147 80	-	29 00
Penobscot, East Eddington Farmers' Club	46 93	-	-	-	168 80	215 73	-	-	70 16	-	186 96	1,500 00	-
Penobscot, Orrington	48 10	-	-	79 25	554 11	681 46	60 00	274 25	75 00	192 62	725 92	1,050 00	250 00
Piscataquis, East	-	-	-	-	-	-	-	-	-	-	-	-	-
Piscataquis, West	-	15 00	-	-	25 00	40 00	-	-	44 64	-	68 94	-	29 44
Sagadahoc County	501 22	564 00	1400 00	705 00	4,254 29	7,424 51	150 00	1,170 00	1,666 31	2,993 67	7,424 51	5,000 00	350 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	35 63	-	-	-	134 25	169 88	35	-	33 35	42 39	177 74	50 00	3 11
Somerset County	58 52	2 50	225 00	62 50	701 25	1,049 77	375 00	175 00	97 53	33 29	873 42	1,150 00	384 00
Somerset, East	-	-	-	350 00	1,104 99	1,454 99	150 00	800 00	-	955 74	2,054 99	1,500 00	2,000 00
Somerset, Central	-	-	-	-	-	-	-	-	-	-	-	-	-
Somerset, New Portland	-	-	-	-	-	-	-	-	-	-	-	-	-
Waldo County	-	-	-	-	-	-	-	-	-	-	-	-	-
Waldo and Penobscot	250 00	-	26 15	272 50	3,294 71	3,843 36	737 76	1,420 24	613 81	326 99	4,093 40	2,500 00	50 00
Waldo, West	-	-	-	-	-	-	-	-	-	-	-	-	-
Waldo, North	91 50	36 00	-	86 25	482 65	696 40	-	400 00	143 40	-	822 82	-	-
Washington County	151 14	21 00	-	158 25	1,115 26	1,445 65	-	466 50	263 06	15 00	1,193 01	1,700 00	1,000 00
Washington, North	34 89	-	-	121 00	445 79	601 68	-	340 00	51 50	94 68	601 68	3,000 00	2,000 00
Washington, West	360 30	2 00	-	265 00	2,697 54	3,324 84	25 00	665 00	563 97	766 83	2,909 10	2,218 31	1,020 49
Washington, Central	-	-	-	-	-	-	-	-	-	-	-	-	-
York County	-	-	-	-	-	-	-	-	-	-	-	-	-
York, Buxton and Hollis	-	-	-	-	-	-	-	-	-	-	-	-	-
York, Ramshackle Park	-	-	-	-	-	-	-	-	-	-	-	-	-
York, Shapleigh and Acton	143 05	214 00	60 00	-	6 55	423 60	-	-	14 80	25 25	404 05	2,000 00	-
York, Ossipee Valley Union	200 00	-	-	582 50	1,576 73	2,359 23	128 64	1,000 00	132 50	837 74	2,359 23	6,500 00	1,815 27
York, Springvale Agricultural and Mechanical Association	-	-	-	-	-	-	-	-	-	-	-	-	-
York, North Berwick Agricultural Association	195 50	-	-	340 00	1,561 30	2,096 80	100 00	675 00	1,056 25	90 46	2,152 61	8,000 00	5,175 00

MAINE BOARD OF AGRICULTURE.

ANNUAL MEETING, 1900.

The annual meeting of the Maine Board of Agriculture was held at the rooms of the Board, State House, Augusta, January 17 and 18, 1900.

WEDNESDAY, JANUARY 17—FORENOON.

Meeting called to order by the president, E. E. Light of Union. A committee on credentials was appointed by the chair, as follows: F. H. Rollins of Franklin county, W. H. Snow of Piscataquis county and G. N. Holland of Penobscot county. This committee, after considering the credentials presented to them, reported that the credentials of A. N. Douglass of Kennebec county, for three years from the third Wednesday in January, 1899, James L. Lowell of Androscoggin county, to fill the vacancy caused by the death of B. F. Briggs, and J. A. Roberts of Oxford county, Ansel Holway of Somerset county, John F. Buker of Sagadahoc county and Samuel Garvin of York county, for the constitutional term of three years from the third Wednesday in January, 1900, were satisfactory, and declared these gentlemen as duly elected members of the Board. The committee also reported that credentials for John W. True had been presented, also a protest against his being seated as a member of the Board, and other papers relating to the matter. The committee were unable to agree and referred the matter to the full Board.

On motion of Prof. Woods,

Voted, That the report of the committee on credentials be accepted, and the members whose credentials were correct be seated as members of the Board.

POTATO FIELD OF E. A. ROGERS, HARPSWELL.
Varieties, Gems of Aroostook and New York Belle. Yield, 373 1-3 bushels of merchantable potatoes per acre.

The papers relating to the election of Mr. True were then considered by the Board, and after some discussion, it was

Voted, That the credentials of John W. True be accepted, and he was declared elected a member of the Board for Cumberland county.

Adjourned to 2 o'clock, P. M.

AFTERNOON.

Officers were elected as follows: President, John M. Winslow, Nobleboro; vice president, E. F. Allen, Columbia Falls; member of the executive committee, F. H. Rollins, Chesterville; member of the Advisory Council of the Experiment Station, B. Walker McKeen.

The following committee on pay roll was appointed by the chair: Samuel H. Garvin of York county, W. H. Snow of Piscataquis county, and J. L. Lowell of Androscoggin county.

ANNUAL REPORT OF THE SECRETARY.

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

In reporting the work of the Board for the past year, I cannot say that any material changes have been made. It has continued along about the same lines as usual, and the general tendency of our people has been along about the same courses as formerly. The general upward trend of prices for all farm products has stimulated to larger production, and there has been a larger demand than ever before for the educational work of the Board.

Farmers are, in a measure, heeding the words of the Board in its efforts to induce them to make their farms more self-supporting, and are also, as far as I can judge, inclined to extend the amount and variety of their home produced stock fodders.

The crops of our State for 1899, were, as a rule, very satisfactory. This was particularly true of corn, potatoes and the grains. The fruit crop was again light, except in rare instances, where good care of the orchard during 1898 had given it that vitality necessary to produce a crop the following year. Where this was the case, there was, I believe, in every instance, a satisfactory crop of fruit, which brought good prices in the markets. I believe that conditions governing successful orcharding in our State have entirely changed since the advent of the caterpiller and the fungous diseases; that it remains for the specialist, and the specialist alone, to create conditions which bring the paying crops. This being the case, I believe the importance of the industry demands even more attention in the future than it has had in the past, although talks on orcharding and small fruit fruit growing have been given in 33, or 39 per cent, of the Institutes held the past year, and I wish to acknowledge the very great assistance which Prof. W. M. Munson, and Prof. Elijah Cook, as President and Secretary of the Maine Pomological Society, have been in this work.

The severe and long continued drought in many sections of the State materially reduced the amount of the hay crop, but so far as I have been able to learn, it has more than the average feeding value, and with careful handling, will enable the farmers who are taking full advantage of supplementary crops to carry not far from the usual amount of stock through the winter.

Much effort has been put into encouraging our farmers to increase the number and value of their live stock and I think this work has been fairly effective.

I append the report of our special correspondents from all sections of the State giving the averages of our principal crops, and as these averages correspond very closely with those given by the correspondents for the United States Department of Agriculture, compiled from entirely different sources, I believe them to be fairly correct. The general average is as follows:

Quantity of apples, 33 per cent; quality, 85 per cent; 70 per cent of winter varieties. Yield of potatoes, 160 bushels. Yield of yellow corn, 45 bushels; sweet, 2,320 pounds. One hundred per cent of young stock will be wintered. Condition of grass fields, 75 per cent.

NEW AVENUES OF TRADE.

Secretary Wilson has continued his work in extending the markets for our farm products into foreign countries during the past year with very encouraging results, and I quote from the very interesting account of this work as given by Assistant Secretary Brigham, at the Farmers' National Congress, held in Boston last October: "Our own people consume large quantities of the products of the farm. They are better fed and clothed than any other people in the world, but when their wants are all supplied, we still have a large surplus to sell, amounting in 1898, to $858,507,942. We shall have nearly if not quite as much in the year 1899, and I see no reason why we should not, for many years to come, have a large surplus for which a foreign market must be found."

THE DEMAND FOR HORSES ABROAD.

"The Secretary of Agriculture has made inquiries into the demand for horses in foreign markets, believing that the United States should supply it. With the exception of Hungary and Russia, we can produce horses cheaper than any country in the world, while at the same time our horses are better suited to the requirements of Europe. Last year we sold from the United States, 51,150 horses. This year our exports have fallen off somewhat in value."

IMPROVEMENTS IN CATTLE.

"The department is endeavoring to obtain and disseminate information regarding cattle breeding and cattle feeding that will be valuable to the people of the United States. Competition in the export of cattle is growing. * * * Cattle are now bringing good prices, as they are not increasing as fast as the population. Extended commerce also increases the demand. * * * The present prices warrant the production of cattle in the east. It is probable that the number of cattle grown on the western ranges will decrease rather than increase. Our exports of live cattle in 1898 amounted to 439,255 head, valued at $37,827,500. * * * Our total exports of beef in 1898 were valued at $31,906,384.

EXPORT OF HOG PRODUCTS.

"While we do not ship many live hogs abroad, our exports of hog products are very extensive, amounting in 1898, to $110,801,151, with a slight increase over that amount in 1899."

RAISING SHEEP FOR MUTTON.

"We can produce mutton for Europe just as economically as we can produce anything else. In 1898, we sent abroad sheep valued at $1,213,886."

AMERICAN BUTTER ABROAD.

"Our exports of butter, cheese and milk in 1898, were $9,095,759 and in 1899, $7,629,211. The department has at present, butter on the Pacific Ocean, destined to six different ports of the Orient, for the purpose of getting the facts connected with that trade for the benefit of the American butter and cheese makers and American manufacturers of condensed milk."

KING CORN WILL GO TO PARIS THIS YEAR.

"This year, we shall sell corn quite extensively, as the present crop is probably the largest ever produced in the United States. The great crop of 1896 found its way into all the markets of the world, and made new markets for itself. In 1897, we sold something like 177,000,000 bushels and in 1898, 208,000,000 bushels. There was a decrease in the export of 1898 of over $3,000,000 worth because the consumption in the United States was much greater and prices higher than for some years. We shall doubtless have a large surplus for export in 1900. It would be much better to transform our corn crop into articles requiring the employment of skilled labor in our own country, rather than to send the raw material abroad; but until we learn to do this, we must find the best market obtainable for our surplus. Our corn is sweet and wholesome and may well be used for food by people all over the world as we use it here in the United States. It is not likely to entirely replace barley and rye on the tables of the poor abroad, because rye and barley have a greater percentage of muscle-making material than corn; but well-to-do people who can buy meats and fish and cheese would consume more of it if they knew more about it; and for that reason we purpose at the coming exposition in Paris to have our corn prepared in many ways and presented to the visitors with literature printed in several European languages, giving information concerning this great product of ours. * * *

It is probable that, with a foothold in Asiatic waters, an extensive market will be opened up in Asia for the products of American farms. We must be ready to enter every new field with the first, in order to secure at least an equal opportunity for the sale of our products. The exports from Pacific ports are rapidly increasing. Ten years ago, the total exports from these ports were $26,000,000; five years ago they were $42,000,000; last year, 1898, they were $73,000,000. These exports come principally from the Mississippi valley, and the increased exportation from these ports relieves to some extent the competition with the products of the farms east of the Mississippi river."

OUR LIVE STOCK.

I am again able to report an encouraging increase in the number and value of our live stock. The report of the State assessors for 1899 shows an increase in the number of neat stock raised each year, there being 28,830 three-year-olds, 39,745 two-year-olds and 55,454 yearlings. After allowing a good percentage for those three-year-olds and two-year-olds sold, this still shows a very gratifying increase, and would appear to prove that the efforts of the Board to induce farmers to raise more calves each year had not been unavailing.

There is an increase in the value of all live stock from 1898 to 1899 in every county but two, Hancock and Knox; the total increase being $483,145. The number of cows is 143,833, an increase of 6,389 from 1898, with an increased value amounting to $227,829.

OUR DAIRY INTERESTS.

We have continued to treat dairy subjects at nearly all of the Institutes, and it is a matter for encouragement that the interest of our people is continuing unabated in the work. There is a constant demand on their part for literature and lectures along these lines, which, with cattle feeding included, forms really the basis of our cattle husbandry to-day. I trust this interest may continue till all our dairymen come to fully realize the merits of the business, and fully stock their farms with cows of good producing capacity and prepare themselves fully for the work by becoming informed along lines of advanced dairy thought.

BEEF GROWING.

This subject has demanded more than usual attention during the year. I believe with present prices there can be no doubt but that there is a very encouraging outlook for all who engage intelligently in the business.

EXECUTIVE COMMITTEE.

The Executive Committee has been called together three times during the year. They have been frequently consulted by letter and telephone and have aided materially in the work.

SEED AND FEED INSPECTION.

The law in relation to the inspection of concentrated commercial feeding stuffs has been carefully handled by the Director of the Experiment Station. I have recently received notice from him that 38 dealers were selling the goods without proper tags attached and that 17 dealers were selling gluten meal, linseed meal and Cleveland flax meal that was substantially less in protein than the certified percentage. We have notified all of these parties, sending letters by registered mail. We have received 18 replies from those who were reported as selling the goods without tags, all of which were very courteous, and in my judgment fully explained the apparent violation. Two parties have called at the office and made satisfactory statements. Eighteen have so far failed to respond, and all that have not done so at the close of the thirty days required by law, will be again notified that they will be prosecuted at once unless they show that they are fully complying with the law. The letters to those who were selling goods below the certified percentage of protein have not been out long enough to warrant replies.

CROP BULLETINS.

The publication of the crop bulletins has been continued throughout the year, and appears to be one of the most effective lines of work. Requests to be placed on the mailing list are frequently received, and the number published is constantly increasing. It is our purpose to increase the effectiveness of these bulletins the coming year by revising and enlarging our list of correspondents.

INSTITUTES.

I wish to acknowledge the very efficient work which the members have put into planning and working out their institutes. By their earnest coöperation and the interest of the speakers we have been enabled to hold more than the usual number the past year. These meetings have been fully attended and I believe that I am warranted in saying that more interest has been shown than ever before. Quite a few have been held in places that never had an institute before, it being the object to extend the work as far as possible. The time reported covers the Board year, from the third Wednesday in January, 1899, to the third Wednesday in January, 1900. These institutes will be entirely paid for from the appropriation for 1899, and there will be a small balance in the hands of the State treasurer left for the work of 1900.

Eighty-three institutes have been held as follows: Corinna, Garland, Exeter Mills, South Thomaston, Rockville, Union, Lee, Carroll, Perry, Charlotte, Machias, Indian River, Harrington, Steuben, Unity, Jackson, West Winterport, Readfield, Sidney, China, Easton, New Sweden, Perham, Limestone, Fort Fairfield, Linneus, Amity, Sherman, Ashland, Houlton, Fryeburg, Waterford, Norway, Bethel, Andover, Peru, East Dixfield, East Wilton, Hampden, Kenduskeag, Strong, Temple, North Chesterville, Mercer, Bingham, Athens, Wellington, Cambridge, East Sangerville, Palmyra, Monson, Milo, New Castle, Bristol Mills, North Haven, Rockland, North Alfred, Buxton, Berwick, Lebanon, Saco, Phippsburg, Bowdoin, Brunswick, North Bluehill, North Sedgwick, North Brooksville, Penobscot, Dedham, Wales, East Livermore, East Hebron, East Poland, Danville Junction, Swanville, Center Montville, Belmont, Bridgton, Bolster's Mills, Naples, King's Mills, Pownal, South Jefferson; also an evening meeting at the State fair, Lewiston, and a State dairy meeting at Lewiston. In addition to these meetings, eight evening meetings have been held, one afternoon meeting, and two field days.

On September 11th Mr. Benn and myself started on a trip through Northern Aroostook, holding a meeting on Tuesday, September 12, at St. David. This trip was of much interest and importance and the first trip of the kind to be undertaken by the Board. We found the people earnestly interested in agricultural work and anxious to secure improved stock and learn improved methods.

CORRESPONDENCE.

The correspondence of the office is fully as large as last year, many people writing for information on matters relating to their business, and pains are taken to answer all letters promptly and to study for the proper information from all the sources at command. The analytical subject index of the reports of the Board is found to be of great value in this work, as by its use we are able to turn at once to all that has been written upon any subject. The bulletins of the various experiment stations are of great assistance also, as they afford means for obtaining scientific information which can be obtained from no other source. Through the kindness of the director of experiment stations we have a complete card catalogue of all these publications, which, with the Experiment Station Record, makes a complete record of this work. A copy of all letters written is kept and the copy books are fully indexed. We also have on file all letters received.

AGRICULTURAL SOCIETIES.

The various agricultural societies of the State have had more than the average success. There appeared to be a revival of interest in many quarters, and although some of those societies which had held fairs for many years failed to do so last year, I feel that I am justified in saying that the work done was of a superior order and that these societies should be encouraged as much as possible.

The following figures show the business of these societies:

Number of horses and colts exhibited.............	1,522
Number of neat cattle exhibited..................	6,531

Number of sheep exhibited	1,638
Number of swine exhibited	610
Number of poultry (coops) exhibited	1,580
Amount of premiums and gratuities paid	$18,834 38
Amount of trotting purses	21,827 44
Amount of entry fees for trotting purses	8,346 19
Actual cost of trotting purses	13,481 25
Per cent of premiums and gratuities to total awards,	46
Per cent of entry fees	38
Per cent of stipend to societies not otherwise provided for by law	37.61
Per cent of increase in awards	2
Number of societies receiving stipend	44
Increase from 1898	1

GOOD ROADS.

The legislature of 1897 broadened the work of the Board by giving it authority to gather statistics and publish matter relating to the care and maintaining of highways. In the work as at present conducted it seems impossible to make such advances in the direction of improved highways as are very much to be desired. It has not been found practicable to incorporate the work into the institutes to any great extent and while we have endeavored to keep the work in hand we have not accomplished as much as it is hoped we may the coming season, and we ask the members to take the matter under advisement at this session, to ascertain if some plan cannot be formulated whereby more may be done to benefit the highways of the State. The bulletins and other publications of the Department of Agriculture at Washington are sent to many of our road commissioners and are valuable in their line. I believe the improvement of our highways must come largelv through educational measures, and that there is need of a higher standard of public opinion, in that the full value of better roads is not appreciated. Much benefit would accrue from the clearing out of hedges, and removing obstructions which cause the drifting of snow. The general adoption of snow rollers for winter road breaking would materially lessen its cost, and liberate quite a proportion of the money now appropriated for highways for use in summer, in permanent improvements. I believe from a somewhat careful and extended observation of the country roads of our State that there is an improvement manifest, that they are generally better graded, better moulded, and freer from loose stones and other obstructions than formerly. This improvement has been very marked during the last year.

THE PRESS.

The Board is under more than usual obligations to the press for its kind favors during the past year. Very extended notices of our meetings have been given and full reports published, as far as possible.

The following papers are regularly received at the office: The Maine Farmer, Turf, Farm and Home, Bangor Weekly Commercial, Rumford Falls Times, Lewiston Journal, The New Age, Kennebec Journal, County Gentleman, New England Farmer, Mirrow and Farmer, Hoard's Dairyman, New York Produce Review and American Creamery, besides several local papers, all of which are kept on file.

FARM PROSPERITY.

I am pleased to note that the increase in the prosperous condition of our farmers noted last year, appears to continue. They never appeared more prosperous than now; never have I noted a better feeling among them than now.

There is every disposition possible manifested to take advantage of all advanced methods and to be abreast of the times. These conditions and tendencies show themselves along all lines, and as the prices for farm products increase there appears to be every reason for increased efforts along every line of farm work. I believe that our farmers as a rule are prudent, that they do not spend money till they have it and that necessities of life are always provided for first. Believing these things and noting the improved conditions so manifest in many places, I can but feel sure that they are being favored with a good measure of prosperity.

Respectfully submitted,

B. WALKER McKEEN,

Secretary.

On motion of Mr. Rollins, voted to accept this report.

REPORT OF THE EXECUTIVE COMMITTEE.

On January 31st, Secretary McKeen called the executive committee to Augusta to consult in regard to the request of the president and secretary of the Dairymen's Association that the Board use its influence in aiding them to get an appropriation from the State to assist the Association in its work. Mr. Light and Mr. Winslow of that committee were present, and it was the unanimous opinion of the committee that it would not be judicious for the Board to do so.

The executive committee met in the rooms of the Board on March 16. It was decided to invite the State Dairymen's Association to join with the Board in the holding of a two days' dairy institute in Lewiston in April, subjects, speakers, date and number of sessions to be arranged by Secretary McKeen and Secretary Dyer. In response to that invitation the secretary received the following reply from Mr. Dyer: "I talked that matter over with President Alden, in relation to a meeting at Auburn, and as we have made arrangements for a station at Auburn, we do not think a meeting necessary."

It was decided that the Dairy Conference would probably be held on December 4th and 5th at Augusta. This decision was finally changed and the conference held at Lewiston, owing to the State Grange being held at Augusta, and also Lewiston presenting so strong inducements by the city government and the petitions of the granges of the county. It was decided that poultry products should be included in the exhibits, and it was voted to confer with the officers of the Pomological Society in the matter of holding their winter fruit exhibit in conjunction with this meeting. The Pomological Society finally decided to hold its meeting separately and at Newport.

On March thirteen, the special committee of the legislature on the order of Mr. Beal of Bangor that "A special committee consisting of seven members of the House of Representatives and three from the Senate be appointed to ascertain how many reports of the several departments are printed each year and the cost of same, and recommend to the legislature how many it is advisable to have printed; and to further take into consideration the necessity and advisability of continuing the office of secretary of the Board of Agriculture," seeming to menace the rights and powers of the Board, the secretary again called the committee to Augusta, where they remained until the matter was finally disposed of, without being called before that special committee, which held only secret sessions and gave them no opportunity for a hearing. Our only opportunity for defence of the rights of the Board was to the members of the legislature by personal appeal, after a bill was reported to provide for the election of the secretary by the legislature.

A meeting of the committee was held at the Elm House, Auburn, on October 19th, for the purpose of arranging matters for the dairy meeting. Mr. James L. Lowell, member elect for that county, was called in consultation at this meeting, and formal plans were made. It was the opinion of the committee that it would be well to secure an expert to judge the butter and cheese at the dairy conference from elsewhere than Boston, and the secretary was instructed to do so. It was also voted that the secretary extend an invitation to the State Dairymen's Association to furnish the program for two sessions of the meeting. Mr. Lowell was instructed to arrange for music at the evening sessions, and to make the necessary arrangements for reduced rates at hotels.

E. E. LIGHT,
J. M. WINSLOW,
J. F. TALBOT,
B. WALKER McKEEN,
Executive Committee.

On motion of Prof. Woods, voted that this report be accepted and adopted.

Mr. E. E. Light—I will take this opportunity to mention a matter that I suggested at the dairy conference, Lewiston, which is this: The meetings of the Board of Agriculture, as you understand, now consist of one annual meeting, at which we are now assembled. We have an executive officer, and we have an executive committee that may be called together at any time during the year, but the members of the Board do not assemble in any manner that they can take direct action upon any matter that may interest the Board, at any other time, and it has seemed to me, from my experience on the Board, that if matters were so arranged that we could have this Board meet oftener than once a year, where they could consider matters as a Board, they might be in closer touch with the office and with the work of the Board. Therefore I suggest that this meeting, if it can be done properly and legally, should be not finally adjourned but adjourned to some particular time during the year, and I had in mind meeting during the State Fair at Lewiston in September. It seemed to me that might be a favorable time from the fact that it is after we have got through the press of summer work in a measure, and the season for institutes generally follows soon after, and also arrangements have to be made soon for the dairy conference. Perhaps some other time might be more favorable, but my idea is that this meeting be adjourned to some date that may be suggested, if it can properly be done. I submit this matter to you for consideration.

Prof. CHAS. D. WOODS—I have not been a member of the Board for a very long time, but I have been a member as long as most who are present, and I think that at every meeting this question of credentials has come up in some form. And it seems to me that it would be very desirable for the executive committee, or some special committee, to look up the standing of the various agricultural societies, and look up the legislation on the matter, so that when the convention assembles whose duty it is to elect a member, they can do so without making so many mistakes. I think that there is now in the office plenty of information from the Attorney General so that his rulings on the law can be found out, and it would be practicable, I should think, for the executive committee to make a list of the societies in the different counties who have a right to unite in such a convention. I would move that the executive committee be instructed to take this matter into consideration, and if they find it practicable, report that at the time the secretary instructs the oldest societies to call a convention he send them a digest of the law with the rulings of the Attorney General, and the names of the societies in their respective counties that are eligible to that convention. This motion was carried.

Mr. LIGHT—I want to ask Secretary McKeen what he refers to in his report, when he speaks of the use of snow rollers in the breaking of roads.

Mr. McKEEN—I think every member of the Board is familiar with the fact that there are many towns in the State using heavy, large, long snow rollers for road breaking, and if there are members who are acquainted with their use, they know that it is the cheapest and the best possible method of breaking roads. After the great blizzard last year, we broke all of our 100 miles of road, in the town of Fryeburg, for $100, and did not pay out ten dollars for the shovelling of snow.

Ques. Is it a land roller?

Ans. It is a common land roller, only large and heavy.

Ques. How many rollers does it require?

Ans. I think we must have as many as five. We began with one, and had a great fight to get that, but now we never use anything else. If there is a road that is not frequented very much we have a lighter, cheaper roller for that. On the principal travelled roads we have a roller in two sections, each section seven or eight feet long. We have one roller seven feet in diameter, I think, but the most of them are about six feet in diameter. We do not shovel any snow at all. The idea is to keep on top of the snow. Probably in this last snow they would do it all with six horses, perhaps with four. Sometimes they put on eight, and it was reported that they used for a short time last year, ten. If there is any drift that the horses will not plunge through, get it down so that they can get through it. I was talking the other day with a gentleman who drove me from Bridgton to Naples, and who is a builder of snow rollers. He said he built only with two inch Georgia pine, and the ends of the rollers were made with the same material; they were six feet in diameter, and a seven foot section, I think. A roller built like that is very heavy.

Ques. What was the cost of such a roller?

Ans. I think he said he got $65 for it.

Ques. What is the condition of those roads in the spring of the year?

Ans. It is first-class, because you keep on top of the snow. There are no places in the road where the snow is all gone. The snow is on the road as long as it is anywhere, and if the roller has been used often enough it will never slump badly.

Ques. Where there is a very large drift, you would have to shovel some?

Ans. Yes, but you would not shovel a hole through it as wide as your roller, because the first wind blow would fill it again. The idea is not to shovel any if you can help it.

Mr. J. A. Roberts—There is a machine that is very nice for smoothing roads. In the springtime, when the roads are very uneven, this machine, which is a sort of a scraper, will run over a road and make it level and smooth.

Mr. McKeen—They have one in Aroostook county, made by a man who lives in Castle Hill, and it is a very good machine. We do not find it necessary to use anything but the roller. We have roads running in every direction, we have 100 miles of roads in the town, and it is one of the things about which the people in the town are unanimous in their sentiments, that this is the best possible way of doing. I do not know as we ever take more than three men along with the roller. The idea is to avoid shovelling by every possible means. If there is a drift get the snow from one side to the other, so as to level the road. If you dig a trench you have got to keep it going.

Mr. Light—I would like to inquire of the secretary in regard to Mr. Harris. I understand there has been some correspondence with him in relation to visiting this State.

Mr. McKeen—Mr. Harris of Vermont was here a year ago last fall and delivered a lecture on Sheep Husbandry in Franklin and Somerset counties. He is a man who thoroughly understands his business, and at that time he became very much interested in the island sheep industry as conducted on the islands on our coast, and said that some time he wanted to come here on his own account and investigate the matter. Very soon after reaching home he was taken seriously ill, and has just recovered. He commenced correspondence with me several weeks ago, asking that we might go into the matter of investigating the island sheep industry. He would like to come down when the sheep are in their winter quarters, and see what condition they are in, and get some photographs, and some facts that might be of interest and value to the business. He is a great rape man. He believes, and I believe, that if we should grow more rape in the sea-coast towns it would be a great help in the business. I wrote to Mr. Allen and Mr. Light, and I have had several letters from people in Washington county besides Mr. Allen who are interested in the work, and it is probable that, unless some objections are made, he will come down a little later in the season, and we may go on to the islands in Knox county, and possibly Washington county, and in that connection hold one or more meetings. It is quite largely a private matter with Mr. Harris, but if we hold public meetings and he addresses the meetings, of course we should expect to pay him something for that. Mr. Light and Mr. Allen know particularly about this business, and I should be very glad to have them say something about it.

Mr. LIGHT—In Knox county, the largest island is off Rockland, formerly called North Haven. It is quite a large farming town. Also Vinalhaven and numerous smaller islands have been devoted quite largely to sheep raising, and it has been the custom there in years past to winter the sheep upon the islands, and the sheep got their own living, and their shelter was the spruce bushes that grew there very thickly. I, personally, have had no experience in the business. I have seen the sheep on these islands, but not near enough to observe them very much. They claim that the sheep winter well there, that they winter better than they would if kept in barns and stall fed, as many flocks are, even there on the islands. But the Society for the Prevention of Cruelty to Animals (I think it has a new name now, but this is the name of the old society) have been threatening the sheep owners along the coast. That society has its headquarters in Portland, and they have made considerable many threats to the sheep owners, so much so that the people in the vicinity of Knox county have, I think, nearly abandoned the practice of keeping their sheep on the islands. We held an institute the first of December at North Haven, and we saw a good many of the sheep raisers there. In the first place, they were very much prejudiced against the Board having an institute there, as they labored under the impression that the Board

POTATO FIELD OF W. P. ATHERTON, HALLOWELL.

was simply an auxiliary of this Society for the Prevention of Cruelty to Animals; that they were sort of spies and assistants of that society, and it required considerable work on our part to overcome that prejudice. But as soon as they found out our real purpose they were very much pleased with our work. They had an idea that there was a special provision prohibiting the keeping of sheep on those islands without shelter, and I wrote to the agent of the society in Portland, inquiring about it. He replied to me and cited the general statute relating to the neglecting of animals or exposing them carelessly to the inclemency of the weather, but it is only a general statute.

Mr. E. F. ALLEN—On the coast of Washington county, sheep have been kept on the islands for a great many years. I do not know how many, but at one time when wool was high, it was very profitable. There are several large islands south of Milbridge and Steuben. There is the island of Boisbubert, that is capable of carrying some five or six hundred, and Roque island, which could carry about as many more, and at times they have been stocked with sheep. The only protection that the sheep ever had was the bushes, and after they once got acclimated they would do well, and loss from cold, I think, never amounted to anything. The only difficulty was that at times they would get out on to the ice and the sea would come over them. I think the greatest loss was from that cause, and hardly ever from the weather. They stand the weather all right, by going into those bushes for their shelter, and I do not think there would be any occasion for any humane society to trouble them. The wool is finer than any wool grown anywhere else, especially on sheep kept in the barn. It is thicker and finer, and naturally would be. After the price of wool went down, the number of sheep kept fell off, and they have hardly got back to the original number, but there is no doubt in my mind that it might be made profitable and the business increased very much.

We have a great cattle ranch down there in the north part of Cherryfield, in our minds, and many down there think that it is practicable. There are hundreds of acres in the town of Deblois and that neighborhood, north of Cherryfield, where much of the land is meadows and intervales that grow hay naturally. Although I do not know very much about what is being done, I know that men who were interested in the business have been down there and looked it over and have pronounced the place such that the thing can be done. They think that cattle can be kept on those plains in large numbers. As I understand it, they do not intend to keep them without shelter. They expect to divide them up in sections and have men to take care of each lot, and have them housed, and, as I understand it, have them yarded, so that they may use the dressing to fertilize the land and make a business of raising hay on those lands to feed to the stock. The intervales are natural grass land and bear crops every year. On the uplands, they claim that a species of coarse grass grows, which does not winter-kill, but just as soon as the snow is off, the grass is ready for the cattle to go on and get their living in April. But I am telling you something that I do not know about.

Ques. What time does the snow cover the ground?

Ans. It is not uncommon for cattle to get their living there until Christmas time, and sometimes later. They get wild, sometimes, and stay out nearly all winter.

Ques. What is the quality of the grass on the intervales?

Ans. On the embankment it is a mixture of English or browntop and blue-joint. On bog lands the quality is not so good.

On motion of Mr. Roberts, voted, that a portion of the papers assigned for Thursday afternoon be now taken up.

SMALL FRUITS.

By GEO. N. HOLLAND, Hampden.

As I have but a few minutes for this paper, I will proceed to repeat the "old story," beginning with the strawberry: How it is the first berry to ripen, it is so varied and delicate in flavor that it suits almost every palate, there is an ever increasing demand for the fruit, and every garden should have its strawberry bed, that the household may be well supplied with fresh fruit and have a surplus for the cans and jelly tumblers for winter use.

There are six species of this fruit, and all but one are edible, which is the Indica, a native of India. The Collina is considered a species. The fruit is greenish-brown when ripe. The Elatior is a native of Germany; the fruit has a strong musky flavor. The Vesca is a native of Europe and America. It bears the names of Alpine, and Wood strawberry. The Virginiana is a native of North America; the Grandiflora of South America. The name of these species, Fragaria, was given to them on account of their fragrance. The name strawberry was derived from the Anglo-Saxon word "Streoberie."

As we are familiar with the three last species mentioned, we will consider their habits only. The Alpine or Wood strawberry bears its conical fruit mostly above the foliage, the seeds maturing on the surface of the berry. Some of the kinds of the Alpine are propagated by runners and others by seeds, the stools of the latter being divided for that purpose. We have no use for this berry unless we grow it as a novelty or for plants to border walks or beds, for which it is well adapted. For this purpose, sow the seed in February or March and by transplanting in season, the plants will bear fruit until late frosts. The flowers and fruit, being borne above the pale green leaves, give a pleasing effect.

We will give more attention to the other two species, the Virginiana and the Grandiflora. The former is a native of North America. Its foliage is generally dark green and abundant. The fruit matures beneath the foliage and is conical, the seeds are deeply pitted, and it is the most fragrant of known species. This berry was introduced into England in the seventeenth century, but did not receive much attention for a hundred years. When it was found that by planting seeds, new and improved kinds could be obtained, it was soon brought into notice and had no rivals in the English gardens for many years.

The Grandiflora is a native of South America. It is a large flowering species, fruit sweet and highly perfumed, and larger than any other species. It was discovered by a French navigator in 1716, at the foot of the Cordillera mountains near Quito, and he carried it home to France.

The hybridizing and planting the seeds of these two species have produced wonderful results in size, flavor and production; and each year new varieties are added to the already long list of fine berries.

I received a few new kinds of berries five years ago, and after two years' trial, discarded all but the Bubach and Parker Earle, keeping the Michel's Early to fertilize the Bubach.

It is surprising to see how quickly these berries have superseded the Sharpless, Crescent and Wilson. My trial plat this year, twelve by two hundred feet, is set with the Star, Bismark, Clyde, and Ruby, all looking finely, the Bismark in the lead. Another row one hundred feet long is set with four other kinds, the Sample in the front rank. These plats are large enough to determine quite closely the merits of the different kinds.

There is no danger of losing plants when they can be taken from the trial bed and removed to another place near by, but when coming from a long distance they are apt to heat and very few can be saved. When received by mail or express they should be immediately released from confinement, the roots shortened one-third with a sharp knife, and the plants spread loosely in a cool, damp place, or in water in which soil has been mixed. The setting of imperfect plants should be avoided. Side runners often appear between the sets, and pursue the same course of establishing plants as the main runner. Use them as weeds; select the best, and there will be no complaint of the strawberry-bed running out.

In setting plants, give them plenty of room, so that the air can circulate freely, and winged insects can go from flower to flower, that perfect fertilization may be obtained, and to enable the cultivator to hoe among the plants and work into the soil quick-acting fertilizers; and as the fruiting season approaches there will be a better chance to place around the plants the mulching so necessary for the double purpose of protecting the berries from dirt and retaining the moisture for the plants; for they must have an abundant supply of water in the fruiting season to secure the best results.

When Mr. Hovey produced his seedling strawberry, the "Hovey," in 1834, it gave a new impetus to strawberry culture, and for a long time the pistillate varieties were sought for as being superior to the staminate kinds. But it has been demonstrated that the perfect flowering kinds are as good, or better, than the pistillate varieties. For instance: The Bubach is one of the best pistillates, and now it is claimed the Bismark is its superior. If it is equal to it, we have no more room for the Bubach as the Bismark is a staminate. Then we have the Star, Clyde, Fountain, Glen Mary, Nick Ohmer, Ruby, and a host of other varieties to select from, which are staminates of fine quality, and large berries; and in selecting them much trouble and often failure can be avoided.

It is better to cultivate the staminates, then the different kinds can be kept separate, and when the plants are taken up you can assure the purchaser what kind he is getting. We hope the cultivation of this berry may be increased, especially for family use among the farmers who, with plenty of land and dressing, seem to have no excuse for not having their tables well supplied during its season with this appetizing berry.

The currant can be grown to great perfection and large returns per acre can be obtained. The hilling up of the bushes should be avoided; rather, level and shallow culture practiced. The manner I pursued in boyhood still recommends itself to me as the best way to propagate the currant. Take the longest and strongest stalk of one year's growth from the bush, and cut off the top of this stalk close to a bud to see if the wood is sound. If the centre is black or hollow cut away until live wood is obtained. Shape the lower end into a blunt wedge form, close to a bud, which be careful not to injure. Remove every other bud except two or three at the top of the stalk, from which the branches will start.

Theses stalks can be thrust into the ground from four to six inches. If this is done quite early in the spring the roots will soon appear at the bud left at the lower end of the branch, and a strong, vigorous bush of tree form will be the result. Bushes grown in this way can be pruned and cultivated easier than any other form of growth. In pruning let three or four branches grow each year and after a branch has borne two crops remove it. In so doing a well balanced and healthy top can be sustained for a long time and will not become so dense that nothing but inferior fruit can be obtained.

While the currant can be grown on almost any soil or in any locality and will produce a crop under almost any treatment, it is not so with the gooseberry. An open, airy situation, and clean culture, with the tops well thinned out, are very necessary to insure good results. They should be dressed with well-rotted manure and all decaying matter kept from the planting, and weeds should not be allowed to grow among the bushes. These precautions are very necessary to ward off the mildew. The tree form of growth is recommended for this berry as well as the currant. The borer seldom attacks the gooseberry. The best way to propagate this berry is by layers, which can be easily done by securing the thrifty branches to the ground and placing soil over them, when they will readily root.

The following plan is the best way for planting and caring for the blackberry. Late in the fall secure the roots of the kind of blackberry desired, and protect them from freezing during the winter, or they may be dug in the spring, but not allowed to dry. Prepare the ground as for potatoes, and every third row take for the berries, planting the other two rows with some low-growing crop. Cut the blackberry roots in pieces three inches long, and plant them one foot apart in the row. Cover level with the ground. When the canes appear destroy all but one in a hill, and when they grow to the hight of three feet, stop the growth, which may be easily done with a sickle or long sharp knife. By checking the upward growth, a stalky cane with ripened wood and plenty of laterals will be obtained. The laterals should be cut back.

Blackberry canes are not hardy north of 40° and need protection during the winter. The best way is to bend them down and partly cover with soil. This can easily be done by thrusting a spade into the ground on one side of the cane, and while prying up the plant press with the foot against the cane close to the base until it lies upon the ground lengthwise with the row. In this manner the plant is bent in the root and no injury is done; while by bending above the ground many canes are broken or injured. After laying the canes down, keep away all covering except what soil was used to keep the bushes in place, until the ground is frozen, as a precaution against the mice.

In the spring a fork is used to release the canes, when they should be placed upright and the soil firmed around the stalks. The second and third season the same culture should be given as during the first year, except that a heavy mulching should be applied before the fruiting season. If the canes have been kept within the row, this can be done with little labor. After fruit the third season, destroy the canes and roots as soon as possible. To keep the amount of berries wanted, new plantations can be started easily with some low-growing crop. All the manuring and cultivating should be done before fruiting as far as possible, so that no new growth will start in the fall, as might if cultivation should continue. The object is to get "ripe" wood as well as ripe berries, so that the bushes may withstand the cold of winter and be in better condition in the spring, with full vitality to do their season's work.

OUR BEST CROPS.

By JOSEPH ELLIS.

I will suggest that the three best crops for the farmer of the State of Maine are, first, hay; second, corn; third, oats and peas. Now we will take up the hay crop, and I am going to say on the start that the hay crop is the backbone of all agriculture in the State of Maine, I might say all over New England. It is the backbone of all farming in Maine. The farmers in Waldo county have been cruelly abusing the hay crop. Why? Because they have been selling hay. We have all been selling hay, and it was almost a panic with us when the time came that we could not get more than five or six dollars a ton for hay, which was in 1898. We think now, down in Waldo county, that the era is dawning when we can get a new market for our hay, and it will come by the bringing in of the dairy industry.

Next to the hay crop I will put the corn crop. I think the corn crop would come second, and the reason it would come second is that we can grow more fodder for our stock on an acre of corn than on an acre of any other crop. We can raise a piece of corn cheaper than anything else that we have to plant or sow, and it is better for a great many uses. I believe that the corn crop, properly managed, is a very near neighbor to the hay crop. I believe that in our county the introduction of the silo is of a good deal of importance, in increasing the raising of corn. There are a great many more acres of corn being raised through our county than there were a few years ago, because they can take care of it by the use of the silo. Some of our people, in locations where they can get at the corn factories, are raising quite a lot of sweet corn, and they think it is a fair business, although they think they ought to get a better price than they have been getting. I have been somewhat acquainted with the use of corn for silos, and in every case the farmers feel that it is an important matter, and that the ensilage is a very good auxiliary in years of a short hay crop. I believe that the time is coming when the dairying business is going to take the place of selling hay in our county.

We now come to the third best crop. We do not think of laying down a piece of ground, in our county, after we have cropped it, without sowing some kind of grain. We think we can get a great deal better catch of grass, to sow the land to a crop of grain than we can to sow the grass without putting on any grain. In some parts of the State the sowing of grass where corn has been grown is advocated, but in our locality we do not practice that. We practice sowing our grass with a grain crop. Experiments have been made in turning over a piece of ground and sowing it to grass, but they were not satisfactory. We have been in the practice of sowing oats alone quite largely, but the people now are getting into the habit of sowing peas and oats, for they claim they can get just as many bushels per acre by sowing peas and oats as by sowing oats alone, and that peas and oats are worth very much more than the oats alone. We think that peas and oats are a better feed than many feeds that we have to buy. We are trying very hard to get rid of going out West to mill. We are thinking that if we work the corn crop to advantage, and then use oats and peas, we may have a key to what will help us out. I do not think it is well to sow peas and oats late in the season, and sometimes when we have a wet piece, and the season is wet so that we cannot get on to it to sow it when we would like, we sow barley, and this is quite satisfactory. But I think there is no one with us who sows barley if he can get on to the land at the proper time to sow peas and oats.

First, let us raise all the hay we can, and to help us raise the hay let us plant a piece of corn, the largest piece we can. I do not care how large the piece is if we only take care of it. And then, when we want to lay down our land, let us sow peas and oats, and I think we are in a pretty fair way of farming.

Dr. A. W. Harris—The thing that occurs to my mind at present is the rapidity with which agriculture, so far as it is represented in this Board, seems to be progressing. It certainly has some disadvantages, and it has some advantages. The Board itself is extending its influence more and more rapidly as the members change and represent new constituencies. I have been struck sometimes—and it seems to me that it is worthy of note—by the change that goes on in the faces of students.

Notice a body of boys, and the next year you will see that something has been stamped into their faces. That change is a progressive one, and if we could only see the freshmen and the seniors side by side we would be very much astonished to see how four years' residence in college, and four years in life, have made new men of them. Of course they are older, and that makes a change, but there is something more. You have put something into the men that tells in their faces. I suspect that if we could follow the Board of Agriculture back year by year we would find that there has been some such change going on, in the men themselves, in the Board, and in the industry they represent. I believe it must be a very great benefit to the men who have the privilege of representing the various agricultural societies to join in the deliberations of such a body. I am sure it has been a benefit to me. And that same benefit extends out to the institutes, the work of the grange, and everything that helps to set men thinking. I cannot tell how correct the theory is that we have just had expounded in regard to the sowing of peas and oats, though I have no doubt that it is entirely correct, but I think it is of immense advantage to have such things discussed, whether it is correct or not. You are putting some of the agriculture into the heads and some of the heads into the agriculture, and it is worth a tremendous amount to the State of Maine and the Board of Agriculture, in stirring up an interest in the business not simply as a livelihood, but raising it to the level of a profession which a man must study, so that in winter he gets ready for the summer, and every summer is a preparation for the next summer. Such work as that, I say, is an inspiration, and we are to be congratulated that we followed a wise course in the State of Maine in extending that influence, not only through the Board itself but through the various institutes and various farmers' organizations. I have been struck with the fact that we have a representation of the grange here, and it seems to me that things are as they ought to be, that the organizations are working together in harmony; not too harmoniously, of course,—if things slide along there is a lack of life—but we ought to congratulate ourselves that there is such a unanimity in desiring the upbuilding and the welfare of the industry.

On motion of Prof. Woods,

Voted, That a committee of two, consisting of Mr. Roberts and Mr. Rollins, be appointed to consider the matter of adjourning this meeting to such time and place as has been suggested, and report at the morning session of the Board as to whether it would be feasible or not.

EVENING.

THE DEMOCRACY OF EDUCATION.

By James S. Stevens, Professor of Physics, University of Maine.

From the earliest times, the idea has prevailed that there are certain kinds of education which should have the preëminence over all others; that to be an educated man, one must have knowledge of certain branches, but upon the multitude of subjects lying outside of this domain, he might not only be ignorant, but it was rather to his credit if he were. The central thesis which I wish to establish is something like this: There is no aristocracy in education. Human knowledge is a unit. To know Latin is part of an education; to know physics is also a part; a course in classical philology makes a man scholarly; a course in agriculture makes him equally so. In short, in all the range of human learning there is no subject, unless we except the three Rs, which may any longer be referred to as essential to an education, or which may boast in the pride of its exclusiveness,—without which not.

The democracy of the various branches of learning is becoming more and more recognized in our day, but that it is not universally accepted, may be inferred from the following passage from an article by Prof. Harry Thurston Peck of Columbia University. I propose to quote somewhat at length from the article, as it embodies principles exactly the converse of those which I wish to establish: "The fact is," says Professor Peck, "that so far from adding to the subjects now included in the university curriculum, we should diminish them. The present craze for making that curriculum a common dumping ground for every possible variety of instruction, is the most unfortunate of all the tendencies that are visible in educational theory to-day. When machine shops and factories and all the paraphernalia of the applied sciences are imported into the academic shades, and when the perfume of the "Attic Violet" is stifled by the stenches of the chemist's crucible, the true purpose of the university is forgotten, and its higher mission is in a great measure sacrificed; for then there can exist no longer a distinct and definite type of university man. It gave to the community a very special class, not only highly trained, and trained in a broad and liberal way, but trained also according to one particular standard and with an absolute identity of training. This identity of training bound all university men together by the strongest possible ties of sympathy and mutual understanding, so that they stood forth as a sort of Sacred Band, alike in private and public life, exercising an influence for serenity and sanity of thought the value of which was inestimable and out of all proportion to the actual numbers of the class who exercised it. But now the curious belief that all subjects of study are in themselves equally important is importing into the sphere of university teaching anything and everything which the casual person may desire to know; and worse than this, it is putting upon every grade of capacity and attainment the self same stamp of approval. Yet those who argue for this equality of value in the subjects taught do not regard the products of such teaching as being equal. They do not rank a great fly-paper manufacturer with a great statesman, nor a great cheese-monger with a great physician. Yet when we say to-day that So and So is a university man, one never knows by reason of that fact alone, whether this person is in reality a gentleman and a scholar, or whether he is only a sublimated type of tinker. Or in other words, the so-called "liberal" policy in university government has not raised mediocracy to the plane of scholarship, but has degraded scholarship to the plane of mediocracy. It has been in every sense, a process of leveling down; in no sense has it been a process of leveling up. This, then, is gradually blotting out the true value of the university as a factor in the nation's larger life. By throwing its doors wide open to every one and for every purpose, and by losing all perception of its original design, its chief importance, and its noblest influence are vanishing away—lost in the well-nigh universal reign of the commonplace."

I need not say to you that I don't believe in such doctrines. Nor need I take time to refute them because I know that you do not.

The fundamental fallacy seems to be this: At the time when there was only one style of education, that style produced our statesmen. Therefore Professor Peck argues that it is the only kind of education that would produce statesmen. Give to certain men any type of education whatever, and they will still be statesmen; others, even the perfume of "Attic Violet" will make nothing but "cheese-mongers." An aristocracy of education will, I take it, never be tolerated in America, any more than an aristocracy of birth.

Any survey of the history of education will show us that the kind of learning in vogue at a given period was the direct outgrowth of the demands of the period. To say that classical studies constitute an education, and that modern sciences do not, would be paralleled by saying that to be a gentleman one must wear knickerbockers, ruffled shirt front, and powdered wig. The Greeks and Romans held a man to be educated when he had mastered his own language, and could dispute in the market place. Outside of these countries Greek was not included in the list of humanities until the time of the revival of learning. From that time until the beginning of the nineteenth century Greek, Latin, and mathematics were regarded as constituting the backbone of any true education. The reason of this is not far to seek. Education was for the few; in the judgment of the authorities, the masses had no need for it, and were only rendered discontented and insubordinate by its possession. Naturally the ideas prevailing in England came over to us, and for the first three hundred years of American history we had no occasion to change them. It was the era of stage coaches and slow sailing ships, of mails few and far between, of agriculture in its hardest methods, of small ambitions for commercial or mechanical progress. After a time somebody found a better way of traveling than the old stage coach and it soon became apparent that it was not Latin and Greek which were wanted to enable men to level railroad beds, design engines, and construct cars. Naturally, therefore, during the present century, the old-fashioned curriculum came to be modified. Mathematics is studied, but in its applied form it has been developed into mechanics, physics, and the various branches of engineering. And as small railroads have combined into larger ones, and these in turn into great corporations, it is still the man with special training, the man who knows the details of the system from the bottom up, who has the key to the situation. Again, until recently, there has been but little necessity for training along the lines of natural history. When the country was new, and sparsely settled, the microbes and bacilli either did not exist, or kept so completely out of sight that they were not troublesome. Land was plentiful and the air was pure, and germ diseases were far less prevalent. With our present condition of affairs, however, came the demand for a training that would enable us to grapple with these enemies of our peace, and therefore now no well equipped institution of learning is without its special force in the department of natural history.

Then, again, we may consider the science of agriculture. When all the land was in the hands of a few men whose livings were secure under all circumstances, it was of comparatively little importance how the fields were tilled, or what crops should be cultivated. To-day a different condition of affairs exists. We have our small farms lying side by side and it is only the man who can make use of scientific principles combined with a good degree of common sense, who can make a living at all. From these illustrations, and from many others, which might be added, the need of a special training is obvious. The chief characteristic of this age is competition, and in the struggle for supremacy only those who enter the battle with a special training are able to keep their footing. Recently in one of the smaller cities of Maine, a large manufacturing company became insolvent. Depending upon that company, directly or indirectly, were thousands of people. In all probability, the failure was due to the incapacity or want of foresight of some one man. When a man is found who is able to take charge of such vast interests, the community in which he lives should be willing, from selfish considerations alone, to pay him a salary that would permanently retain his services. In every community, large or small, there are young men who, if they were given the proper opportunity for development, would become just such industrial powers as these. The problem would be simplified if we could select these leaders in advance, and give them unusual educational advantages; but since this is impossible, the obvious best substitute is to offer educational privileges to all, and in the kindly competition of the recitation hall let each defend his claims.

It was from such considerations as these, that the United States government in 1864, established institutions of learning in the various states the object of which was to train young men along the lines of agriculture, mechanic arts, military science, and others which might be embraced in the term "a liberal education." The policy of the various states in establishing and maintaining these institutions differed somewhat. In the eastern states where there had already been established some large and flourishing college, the general practice was to establish a mechanical and agricultural department in connection with the older institution. Types of this class may be found in Connecticut, Rhode Island, and Vermont. In the western states where no strong institution existed, the state university became at once the head of the educational system. And in such states as Michigan, Wisconsin, Minnesota, and Missouri, we find the state university supreme. In Maine we had no college of conspicuous pre-eminence, and therefore our institution has from the beginning stood by itself, and although located in an eastern state has resembled in character and scope, the state universities of the West.

Three years ago, by an act of the legislature, it allied itself more closely with this style of institution by changing its name to the University of Maine. The term university has a diversity of meanings. In Germany, it is applied to a school where exclusively graduate work is done. In England, it means a collection of colleges; and in the United States, where loose ideas of education are quite apt to prevail, the term has been given a variety of applications. President Harper of the University of Chicago says, "It includes the work of the college, the secondary school, the elementary school, and the kindergarten." In America we have but one institution which is exclusively graduate in its character. Harvard, Yale, Princeton, and even Johns Hopkins and the University of Chicago have strong undergraduate departments. The great institutions of the West are made up of a number of technical schools with which is allied the ordinary four years' course in arts and sciences, and therefore we believe that we did not violate good usage when we took to ourselves our new name.

These state universities and colleges have from the beginning fostered the idea that all branches of human learning were equal. Side by side with courses in Greek and Latin literature are offered courses in Electrical Engineering and Agriculture. Tuition and other expenses being at a minimum, they are accessible to all young men and women who possess brains and pluck. Nowhere else is the idea of the democracy of education so splendidly developed.

Another good point in our state universities, and one which I believe entitles them to a special claim on the consideration of the people, is that they are unsectarian. I am aware that this is one of the vexed educational questions of the day, and that the idea of sectarian or denominational education has many advocates. We hear the plea for the Christian college, and I say, the Christian college by all means let us have. When we come to the question of a sectarian college, however, the propriety is not quite so obvious. I can see how in a theological seminary, we might have Baptist church history, Methodist homiletics, and Congregational pastoral theology; (this isn't the best method, but its no one's business) but to teach Episcopalian algebra, Presbyterian psychology, or Roman Catholic chemistry is certainly more than a blunder.

The cry that our state institutions are godless has long since ceased to frighten, and has almost ceased to be heard. We have at the University of Maine, thirty church members in the freshman class, a Y. M. C. A. with a membership of forty-five, and an average weekly attendance of about thirty. Various members of the faculty aid in their meetings and contribute in one way or another to the success of the association. We believe that this showing compares favorably with that made by any other college in Maine; and that the standard of morality among the students at Orono, is as high as that of any other New England college.

To one interested in the work of a state university it is the technical side of education which appeals most strongly. If, however, we are to believe in the democracy of education, we must not err on the other side and give such subjects a place too prominent. In any scheme of education, all classes of subjects—classical, scientific, philosophical, and technical, should have an equal place. In order to get a proper perspective, let us consider for a few moments the general question of getting an education. If I were called upon to select a few from among many reasons why an education should be obtained at any cost, I would say first, for financial considerations. It is all very well to decry a moderate striving after money, and to sing the old hymn, "I care not for riches, neither silver nor gold." The serious objection to this sort of doctrine is, that it is not honest. Under the present organization of society, silver and gold are desirable things to have. We want them, and if an education helps us to get them, it is a good point in favor of education. That an educated man is worth more in the world's market to-day than an uneducated one needs hardly to be considered. One who devotes ten years to preparation for life's work, ought to be more valuable than he who devotes none. And yet we find in every community, those who took their academic education on a dry goods box in a corner grocery, then graduatetd from a billiard saloon, and took a graduate course in a bar room—and then they rail against what they call their poor luck, and say our social organization is seriously out of joint because they cannot command positions and salaries equal to those of college bred men. To be sure there are rich men who are uneducated and there are many educated men who are not rich, but I am referring to the average man, and no one will gainsay my proposition that education greatly increases one's prospects for financial prosperity.

Passing on from considerations of a lower order to those of a higher, it may be said that education brings power. The old proverb that "Knowledge is power" is just as true as the saying that "Ignorance is bliss" is false. If it is agreed that to gain money is a legitimate ambition, to gain power must be equally so. The men who have played an important part in the history of the United States, have, with a few exceptions, been men of liberal education. Our presidents, our justices, our senators have been, for the most part, college bred; while among the holders of less exalted positions, the great majority have had at least an academic training.

The points already made will doubtless be conceded by all. What I wish to emphasize now refers to a less commonly accepted consideration. It may be stated as follows: Although a liberal education is of great advantage to its possessor on account of a diversity of reasons, its chief advantage is its intrinsic worth. That is to say, an education is in itself a source of happiness, altogether apart from the material and tangible benefits it yields. To those who believe that one's sole object in life is to gain contentment, and who take for their motto "Let us eat, drink, and be merry, for to-morrow we die" this argument will make no appeal, for education does not bring contentment. If, however, one is considering his future happiness, which all will agree, I think, is a legitimate end, then nothing is more conducive to his success than an education. If one has no taste for music or art, he is contented, but the slightest taste acquired for these subjects, renders him discontented, until he has gone on and on mastering the secrets of their power. And this is happiness. And yet there are those who preach the doctrine of contentment; that it is better to have little, and even to be ignorant of any degree of attainment beyond one's own, than to be constantly striving and never satisfied. Suppose Edison had been given to indulging in this form of contentment when he was a successful telegraph operator on a fair salary—where would be our modern electrical devices, which seem now to have become necessities? If Sir Isaac Newton when he saw the famous apple drop to the ground, had said as did the Irishman when asked if the fall of water over Niagara were not marvellous—"What's to hinder?" where would be the whole fabric of modern scientific theory? If it should be our highest ambition to be contented, evolution has been a failure. For our picture of perfect contentment we shall have to go back to our anthropoid ancestors whose ideas of happiness were limited by the size of the cocoanut crop, and whose Utopian dream was to crack a too neighborly skull.

John Bunyan never drew for us a more correct picture than when he told us of the man with the muck rake, down on his knees gathering a few straws, while above his head stood an angel of light, holding in her hands a crown which he might have for the asking. But so busy is he with his rake that he does not even know what he is losing. So it is with education. One cannot convince a young man of the transcendent value of culture if he is so busy with his pleasures or so absorbed in his business that he will not look up. There are, therefore, reasons, and the best of reasons, for cultivating branches of learning in connection with which we do not see the immediate prospect of earning a dollar, or of managing men. And until the time shall come when men shall be absolutely devoid of ambition for culture for its own sake, when studies shall be weighed and estimated solely according to their commercial value, we shall have at the University of Maine, and in every institution which claims to furnish a liberal education, side by side with courses in engineering, agriculture, and law, the equally important courses in Greek, Latin, history and psychology.

And now having spoken at some length on education in general need I apologize for devoting a little time to the University of Maine in particular? To you men and women who can claim Maine as your parent State, the University of Maine is a ward. At home I have two small boys; if any one is inclined to say to me, "You have two remarkably smart small boys," they need not be under the slightest obligation to apologize. You have at Orono a ward which is growing so fast, that unless you visit it every year, you might fail to recognize it. We have a faculty of fifty-three, and 355 students, including 42 in the School of Law. In addition to the School of Law, we have a fully organized and equipped college of arts and sciences, a college of agriculture, a college of engineering, and a college of pharmacy. We publish each year an average of over forty books, bulletins, circulars, and papers, covering the ground of human knowledge from Latin Elegaic poetry to the digestive processes of a snow flea. We have five scientific associations, a philological club, a photographic society, an honorary society, a debating society, and eight fraternities. Our program of study is so extensive that if one should enter the University the moment he was born, and pursue every course offered he would be a voter when they were completed.

I will not take your time to go into details concerning our departments—let a simple enumeration suffice. We give instruction in English language and literature, Anglo Saxon, French, German, Spanish and Italian, Latin and Greek, psychology, logic and philosophy, history, political economy and law, mathematics and astronomy, physics, drawing, chemistry, pharmacy, botany, zoology, geology, mineralogy, agriculture, dairying, poultry raising, animal industry, veterinary science, bacteriology, horticulture, civil, mechanical and electrical engineering, and military science and tactics.

Of the departments, those having the most students are civil and electrical engineering. The department having the best equipment is the department of agriculture. The number of students in the various courses of agriculture averages about twenty a year. This is a much smaller number than we could wish for, or than we are able to provide for. And right here I wish to correct a misconception which is quite common and which is emphasized by people in the State who do not like the University of Maine so well as they ought. They tell us that we have departed from our original design; that it was not the intention of the promoters of the Land Grant Colleges to found a broad university, but a school of agriculture, and when we teach the classics, and pharmacy, and law, we are making a great mistake. We have no better interpreter of the intention of the founders than the words of the organic act by which these institutions were incorporated. Let us read it: "There shall be set aside thirty thousand acres for each senator and representative in Congress, from the sale of which there shall be established a perpetual fund, the interest of which inviolably appropriated by each state which may take and claim the benefit of this act, to the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, and in such manner as the legislature of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

Is it not perfectly clear that the thought in the minds of the framers of this incorporating act, was not that such institutions as the University of Maine, should train the students primarily to be farmers, but to "promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

It seems that some of our good friends throughout the State are not a little concerned because our agricultural department does not surpass all others in its number of students. Well, we should like to have more; we have better facilities for instruction in this department than in any other at the University; and better facilities than has any other eastern institution except Cornell University.

It is our boast, however, that if we are not turning out so many farmers each year as we could wish, we are giving to the sons of farmers and mechanics and tradesmen all over the State, an education, which education would be impossible without the State University. In the college office is kept a record of the occupation of the father of each student who enters. These records reveal the following facts: the parents of four per cent of the students are in the learned professions; of four per cent are engaged in manufacturing; of ten per cent are merchants; of twenty-six per cent are laborers; and of twenty-eight per cent are farmers. May we not claim that the University of Maine is doing all that may be reasonably expected to promote "the liberal and practical education of the industrial classes?"

We are all proud of our alumni. They are the backbone of any institution and the ultimate test of its success. We have graduated twenty-eight classes, and have granted degrees to 588 men and women, but 165 of these have been out of college less than five years, not long enough to have attained to positions of prominence. It has been claimed that our young men have been educated to go away from home, and therefore were no help to the State. Many, indeed, have done so, and much of the success that they have achieved is due to their training in the University of Maine. Let me encroach upon your patience long enough to read a brief list of some of our alumni and the various positions which they have recently held, or are holding at the present time. Except in the case of agriculture and college teaching, the list includes only those who are doing their work in the State of Maine. In agriculture one of our graduates is the director of the largest experiment station in the United States. The chiefs of the divisions of agrostology and animal industry in the United States Department of Agriculture, chemists of experiment stations in Maine, Vermont, Pennsylvania, North Dakota, and Nevada. Agriculturists of experiment stations in Maine and North Carolina; entomologists of the experiment stations of Pennsylvania and Massachusetts; horticulturists of the experiment stations of New York and Maryland; veterinarian of the experiment stations of Maine and Utah; botanist of the experiment station of Tennessee; secretary of the experiment station of Connecticut, professors of agriculture or chemistry in the agricultural colleges of Maine, Pennsylvania, North Carolina, Nevada, and North Dakota; president of Delaware State College, and inspector of nurseries and vineyards for Delaware.

Along industrial lines, our alumni have been members of the executive or engineering forces of the silk factory at Westbrook; the cotton factories in Brunswick and at Waterville; the woolen mills at Oldtown and Hartland; the tool factories in Readfield and Belfast; granite quarries in Frankfort; lumber mills in Skowhegan and South Brewer; slate quarries at Monson, and a manufacturing branch in Portland; pulp and paper mills in Orono, Rumford Falls, and Lincoln; and the new plants in Millinockett and Oldtown.

In the Maine National Guard we have had a colonel and a judge advocate general, major and assistant adjutant general, three captains, two first lieutenants, two second lieutenants, one first lieutenant and quartermaster, and one first lieutenant and adjutant. In public affairs we may mention the attorney general of Maine, the State land agent, nine members of the legislature, postmasters of Bangor, Skowhegan and Fort Fairfield; judge of probate in Somerset, of municipal court in Bar Harbor; member of the State board of registration in medicine. In engineering, the late chief engineer, a division superintendent and assistant engineers of the M. C. R. R., chief and assistant engineers of the Bangor and Aroostook, Washington County, Somerset, Sebasticook and Moosehead Railroads; recent city engineers of Bangor, Rockland, Augusta, and Belfast. Our graduates have been employed on the faculties of the following institutions: The state universities or colleges of Maine, Vermont, Massachusetts, New York, Pennsylvania, Delaware, North Carolina, Tennessee, Arkansas, Indiana, Wisconsin, Minnesota, North Dakota, Washington, Utah, and Nevada; also Harvard, Yale, Columbian, Colby, New York and Syracuse Universities, Pratt Institute, Case School of applied science, and the University of Chicago. The superintendents of schools in Waterville and Belfast, high school principals in Belfast, Bar Harbor, Newport, and Hermon; assistants in Bangor, and Westbrook, and teachers of manual training in Portland and Saco. And so this list might be extended to journalism, law, medicine, and other occupations.

In conclusion: What are some of the general impressions which our university makes on one who carefully observes it? The truest impressions come, not from the buildings, the equipment or from the faculty, but from those for whom all these exist, namely, the student body. To describe, then, our young men and women, describes our institution. I will mention as a first characteristic entire freedom from snobbishness. We have sons of rich men, and they are treated by their fellow students as well as, but no better than their poorer classmates. The president of the senior class and manager of the football team waits on table in the dining-room. One of the College Annual editors darns stockings (it is unnecessary to say that this is a young lady); the editor in chief of our College Annual is paying his expenses by teaching school. The president of the junior class tends fires; the manager of the track team runs a small store; and the business manager of the "Prism," president of the Y. M. C. A., leader of the instrumental club, the president of the sophomore class, and artist on the Annual, work vacations and at whatever odd job happens to be offered during term time.

A second characteristic of the students is their loyalty. One morning a little less than two years ago—it was the morning succeeding the call for troops in our late war with Spain, a large company of our students quietly gathered themselves together at the foot of the staff where day after day over the roofs of recitation halls and shops float the stars and stripes. With serious faces and uncovered heads they manifested their appreciation of the situation by an appropriate salute of the flag; and a few days later sixty of those young men marched to the front; and there were thrice sixty more willing to go if the demand became urgent. When the class rolls were called again in the fall, five of these young men, among the most prominent of them all, failed to respond. To many this teaches a lesson in patriotism, and properly so, but for this occasion, I am going to use it for a lesson in loyalty. Their action in saluting the flag and in following its fortunes even to death was typical. Our students are loyal to the institution, loyal to the faculty, enthusiastically loyal to the president, and loyal to every legitimate interest which is connected with the University of Maine.

Another characteristic of our students is their manliness. In what is perhaps the noblest poem of Hebrew literature the writer has dared to choose for his characters, personages no less august than the omnipotent Jehovah and those associated with him in the work of Creation. As the poem progresses they are pictured as calling into being in turn, the light, the firmament, the land, the sea, the grass, the moon and the stars; and after each creative act, the finished product seemed to pass in review before its creator and upon each was placed the invariable stamp of approval—"and God saw that it was good." Magnificent as is the picture there seems to be something lacking to give it perfection. And as if the Infinite mind appreciated the want of symmetry the narrative pauses—and then—God said "Let us make man in our image, after our likeness; and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth." What wonder that inspired by such conceptions of man's place in creation a *later* Hebrew poet should sing: "When I consider thy heavens, the work of thy fingers, the moon and the stars, which thou hast ordained, what is man that *thou* art mindful of him, and the son of man that *thou* visitest him?"

Most people apply the French epigram "noblesse oblige" to duties imposed on one by virtue of his rank and station in life, but it seems to me that the Latin poet who said "I am a man, therefore nothing pertaining to man is foreign to me" hit the nail more squarely on the head.

Gentlemen of the State Board of Agriculture, our duty as we understand it at the University of Maine, is not primarily to make farmers or chemists, politicians or financiers, Protestants or Catholics, but men. Men who will do a fair hour's work in the class room and play a fair game on the gridiron; men who count the days when their mothers come to see them as the proudest of the year; who stand square on their feet, and look you straight in the eye, and shake hands with you in the good old-fashioned way. We may not always succeed in our mission, but can you offer us an ideal more lofty?

And now what of the future? So far as you represent the State of Maine the answer to this question is with you. The future of your State institution will be anything you choose to make it; you may have any kind of an institution you want at Orono. Anything will do for some states, but for the state of Longfellow, and Hawthorne, of Blaine, and of Reed,—for such a state, the best is none too good.

FORENOON—THURSDAY, JANUARY 18.

The records of the preceding day's meetings were read, and after a slight amendment, approved.

The report of the committee on the matter of adjourning this meeting to some other time and place was given, and after consideration, it was

Voted, That when this meeting adjourns it adjourn to meet in this place on the 21st day of August, at 10 o'clock.

Mr. ROBERTS—To cover this matter that we have been talking of, and also to cover another matter with reference to the electing of members of the Board, I have a motion which I wish to make. I do not care to enter into any argument in favor of it, but the motion will speak for itself. I move that a committee of three be appointed by the president to take under consideration the present system of electing members of the Board, and to recommend, if possible, a method whereby the agricultural interests of the State may be more fairly and broadly represented; this committee shall also consider the advisability of regular meetings of the Board at stated times, its powers and resources for holding such meetings, and shall consider if any other changes in the law governing the duties and powers of the

Board are desirable, and make such recommendations as seem wise. This committee shall report in writing at a future meeting.

The first part of the motion is with reference to the election of members of the Board. There is more or less uncertainty, and in some cases unfairness, under the present method. You see the purpose of this motion is simply that the matter may be investigated. It does not bind us to anything. It simply appoints a committee whose duty it shall be to look into these matters and recommend, and then the Board has power to take such action as may seem wise.

On motion of Mr. Light, voted, that this motion be laid on the table for the present.

FIVE-MINUTE TALKS BY MEMBERS.

ANDROSCOGGIN COUNTY.

J. L. LOWELL—I have had but very little experience in institute work, and so can make but few suggestions. In Androscoggin county, as in many other counties, the dairy industry overshadows everything else, and in some respects I think this is unfortunate. The business of orcharding has been sadly neglected in our county. For the last three years the crop has been a failure, and farmers have lost their interest in their orchards. Some of them go so far as to say that they would like to see them taken out, root and branch, that they might have the land for other purposes. I think this is very unfortunate, and we should try to remedy it. And there is the matter of poultry raising, or the production of eggs. It is a great industry and needs our encouragement. Also a matter that has been entirely neglected and cast one side is the production of road horses. I am well aware that there is a great and growing demand for a first-class road horse. While it is a subject that most of us do not care to say much about, it is a fact that it has brought large sums of money into our State, and will continue to do so, if this class of horses can be purchased. In fact, I think there are no horses purchased anywhere that there is so much demand for at so high a price as a first-class road horse or gentleman's driver.

I have noticed that the ladies attend our institutes in large numbers. It seems to me that it must be rather tiresome for them to sit all day and during the evening and listen to what may seem to them dry subjects. Since they grace us with their presence it seems to me no more than just that for a short time during those sessions, a half hour or an hour, we take up some subject that will be of interest to them, home adornment, home management, or anything that will assist the poor, tired housewife and mother in her duties.

KENNEBEC COUNTY.

A. N. DOUGLASS—As far as I have been able to observe the institutes in this county, I think the line of work that has been followed has been very satisfactory to the people, and I am sure it has to me. The audiences have been very attentive, and I have been pleased to note what I believe to be very gratifying results. I do not know that I can recommend any particular change in the subjects to be discussed. The only thing that I could say would be that I would like to add my favorite subject, that of good roads. I believe that Maine is sadly behind in this matter, and that sooner or later we must heed the demands of the times, and keep up with the procession. I was very gratified yesterday to note the evident interest that all the members took in the discussion of new methods of road breaking by rollers, and it seemed to me that it was a very good plea, quite a forcible argument, in favor of wide tires. If a good wide roller is good for breaking roads, why would not a wide tire be good for making roads? I believe it is the legitimate work of the Board to encourage the farmers to put wide tires on to their wagons. I am aware that the State of Maine, through its legislature, is not yet ready to take any radical step along the line of good roads, and I would not even hope for a change in this subject of wide tires, for the present. But I believe that the Board may do a good deal by encouraging the farmers to put wide tires upon their wagons to be used about their fields, because it surely is a very beneficial thing for them, and in that way it will indirectly but surely aid the advancement of the good road cause.

OXFORD COUNTY.

J. A. Roberts—The institute work, as far as I have observed it in our county, has been very satisfactory. Of course, with a limited number of institutes, it is practically impossible to cover all the subjects to which the people would like to listen, and I wish it were possible for us to have a great many more institutes than we do. In our section, the central section of the county, we get about one a year, and if we could have two a year I think more than double the advantage would be gained. I am greatly interested in the matter which Secretary McKeen presented so well yesterday, that of good roads, and to which Brother Douglass has also referred. This matter was all gone over three years ago, and an act passed and an appropriation made for this kind of work. But the secretary suggests that there have been difficulties in the way of carrying out the law. I would like to have him at some time tell us what those difficulties are. I think perhaps we can readily see what they may be, but for all that it seems to me that this is a matter of great importance to the farmers of the State of Maine. We cannot have the stone roads which they have in a wealthy state like Massachusetts. It is impossible, and furthermore those roads are quite expensive to keep in repair after they are once built, I am told. But a good gravel road makes a good way, if properly made, and I believe that the one thing that those who have charge of roads need is a little light upon the methods of building them. While there are some men who have made investigations upon proper methods of building roads, who have studied soils and their effects upon roads, and matters of that sort, the majority of those who have charge of roads have not given it much thought. They go on in the old-styled way. I believe that if at our institutes we could have some speakers who are skilled, if we can find such, to instruct the people of the State in road building, after a while we would make great advances. We have seen the effect of the institute work upon our dairy industry. We can go out into almost any town in the State and find men who can stand up and give us a good talk on dairy matters. They can give us their own experience in these matters. If we go back a few years, the number of such men was very small. People have become educated in these matters through the institute work, and through the help of the press, and other methods. And so I believe that what we need in this matter of improved roads is education, better methods presented, people set to thinking about these things. Get the road builders to thinking why they make a road in such a way, and then they will begin to learn better ways.

PENOBSCOT COUNTY.

Geo. N. Holland—I think that the institute work of Penobscot county has been carried on, through the suggestions of our worthy secretary, to good advantage. I hardly know what new lines of work we could take up, unless it is this: We have now so many calls from all parts of the county for institutes to be held that it seems almost impossible for us to hold full day's meetings at all the places, and I shall propose to the secretary, if he will help me out in it, that another season, after holding all day meetings at Dexter and Lincoln, from which we have received urgent invitations, we take a route through a number of towns, for instance, Newburg, Dixmont, Plymouth, Etna and Hermon, and back to Bangor again, holding one session at a place and two sessions in a day, one in the afternoon and one in the evening. That will do away with the trouble of having dinner at the halls, and we shall get a great many of those who are engaged almost throughout the entire day in preparing the meals and cleaning up after them, to attend the meetings. I trust the secreary will bear me out in that, and that we can have such a series of meetings.

KNOX COUNTY.

E. E. Light—The institute work in Knox county during the past year has been somewhat on the lines of former years, and it seems that there is not much call for any change. I think I would recommend a little further development of the idea of dividing the meetings, as Secretary McKeen has done throughout the year considerably, holding, perhaps, two institutes on the same day at places not very far apart. By this arrangement the most economical expenditure of the money can seem to be obtained and the most people reached. I have grown in the opinion that we can make the work more popular, and perhaps do the greatest good to the greatest number, by having these institutes conducted largely, and perhaps more largelv than has been the custom, by the members of the Board; the secretary calling upon members of the Board to present papers upon subjects that they are specially acquainted with, and inviting all the discussion possible from the people present. Occasionally it is advisable, I believe, to get a specialist to come into the State, and make as extended a tour as the Board can afford, in giving lectures upon special subjects. I have in mind the lectures given by Mr. Terry of Ohio a few years ago in this State. I think that at the time I was in doubt about their benefit, but I have since become firmly impressed with the belief that they were of great permanent good to the State. Occasionally a speaker can be brought into the State from abroad, of that character, who will do a great deal of good. Otherwise, I think the members of the Board can do great good at these institutes, if they are utilized.

I also might say that, while you know that I am a creamery man and perhaps may think that I make a hobby of the creamery business, yet I believe there is an opportunity for great improvement of the private dairying of the State, if these institutes can improve the quality of the butter by having some kind of an arrangement by which better butter-making practices can be taught at the meetings, if possible.

PISCATAQUIS COUNTY.

W. H. Snow—I do not know as I have anything new to offer. We had last year four institutes, and with perhaps one exception, they were very well attended, and I find that there is a great deal more interest taken than there was a few years ago. Various subjects were talked on this fall, and to excellent satisfaction. I think that Brother Light's idea of working the members, and having them talk at the institutes will work all right in some counties, but it will not in our county. I have invitations ahead for next year, and we are in hopes to look over the ground early and see what they need for subjects, and try to give them some interesting meetings.

SOMERSET COUNTY.

ANSEL HOLWAY—I can say that the farmers of Somerset county are hungry for instruction, and the meetings, as they have been held there, have been satisfactory, always. I think the line of work to take up for the coming year will arrange itself, as the meetings occur. But we want more institutes than we have had, if we can get them. I wish to add a little to what the member from Knox county said in relation to the work of the members of the Board. I had a little object lesson this fall. I was in the western part of Cumberland county, and coming down on the narrow guage road I picked up a little flyer which said that Professor Gowell would lecture this evening in Grange Hall at Hiram. As my time permitted and I wanted to enjoy the meeting, I got off and stopped all night at Hiram, and went to the hall at the proper time. There were about fifty present, and he gave them a grand lecture; it seemed to be upon clover, and all the trouble that any of us found with it was that it was too short. After he had finished, the chairman, Mr. Allen, a gray headed gentleman, rose and commended the lecture and the speaker, and said, "This is the first time for thirteen years that we have had any instruction from the Board of Agriculture." Now if they wait thirteen years longer, that lecture will be lost. But if the member from Waldo county had gone into that grange or any other meeting in that hall, within two or three weeks and given the good talk which he gave us here yesterday, I think good results would have come from Prof. Gowell's lecture, and great benefits would have been received by that community. I think that one way to get at the farmers is by following up a good lecture with an institute, or with the members going in and doing personal work.

SAGADAHOC COUNTY.

JOHN F. BUKER—My experience in institute work has been very limited. I realize that the work that has been done in our county has been good, and good results have come from it. I believe that if we had more institutes it would be much better for the farmers; and I also believe in Brother Light's statement that more work should be done by the members of the Board.

I believe that a man's personal experience, if he is capable of stating it in an intelligent manner, is worth a great deal more to the farmers than the talk of a man who has only the theory. I do not object to theory, but when a man gets up and tells you how he started in life, and how he has prospered, and along what lines he has made improvements, he is the man that can hold my attention, and in my judgment those are the men from whom we receive the greatest benefit. I believe that the secretary should be very careful, and I think he has always been, to work with the member of the Board, and that the Board should find out what the people wish for in the sections where the institutes are to be held, and should be careful in selecting the speakers, and also in the time. These institutes, in my judgment, can be held in grange halls, where they are available, to the best advantage, for it is the Patrons that are interested in the farm work. I also agree with Brother Holland, and several others, who have voiced my sentiments so well that there is not much left to say. I think that one institute in a place, in different sections, is of more benefit than two or three in one section.

WASHINGTON COUNTY.

E. F. ALLEN—I do not think I can suggest anything new, although it seems that it would not be best always to follow in the same paths. Last year we had institutes lasting during the week, and there was no lack of interest. Each one seemed to be better, if possible, than the preceding ones, as we went along through the county, and the people were interested. They did not seem to lose their interest in the testing of the milk. That is something that comes right home to them. They all want to know what kind of cows they are keeping; they are interested in that part of the work, and I think they would be another year. The secretary has been talking of going down there and holding a meeting to talk up this island sheep industry, and I think that would be a good plan, as it will be something that will interest those on the coast, at least. There is a large part of the county farther north that has not been visited, at least, not very frequently, and I think some places have never been reached. In the parts where the meetings have been held, it seems to me that something like what some of the members have spoken of,—something for the ladies, and something for the young people in the evening meetings, would be beneficial. I think it would be well if we could have some speaker who could interest the young people in the subject of staying on the farm.

YORK COUNTY.

SAMUEL H. GARVIN—I do not feel competent to give many ideas in institute work, because I am new on the Board, but I know that I have received a great deal of benefit from the institutes that I haveattended, and I hear good reports from those that I have not attended. The farming in our county is along general lines; we have no specialty that runs through the county. We do some dairying, we have some butter factories and we sell some milk, but perhaps we raise as much young stock as anything, and what would be of interest to such farmers would be of benefit in the county. Some of the farmers are taking quite a good deal of interest in the poultry business. As I go through the places I see every year more and more hen houses being built, and of course any instruction in that line would be of benefit. We do not raise any horses of any amount in York county, and perhaps we ought to. We have been buying horses that come from the West, but I do not believe they are quite as hardy, and will stand our road work, at any rate, so well as the native horses. But horses have been so cheap that there wasn't enough in the business to make any inducement at all for a man to raise them. We are interested in good roads, and I have observed quite an improvement in the road in our vicinity since the law three years ago in relation to road commissioners. If we get a good commissioner, he will build a good piece of road, and it lasts, and then they do not have to go over that every year and spend half as much as it would cost to make it to keep it in repair, but will have something to spend on a new piece of road. We have more obstructions in our roads to hold snow in winter than we should. We do not keep the bushes cut out as we ought, and there are a good many stone walls along the road to hold the snow. If we could awaken interest enough to take those walls away, at the expense of the town, and put up a wire fence so that the snow would blow through instead of lodging in the road, I think we should save money.

Ques. What would be the effect of putting the stone walls into the middle of the road, underneath the dirt.

Ans. That is just the thing to do, if we can afford it. We do a little in sheep husbandry, and I wish we did more, but we do considerable dog husbandry and it does not work well with the sheep husbandry. If we had more sheep and fewer dogs we should be better off, and I would like to touch on that in the institutes, and see if we cannot wake up an interest in the sheep business. I believe that there is nothing that there is any more money in for a farmer than in sheep. From what little I can pick up from people that keep a few sheep, I know that there must be money in the business. People have been asking for institutes since they have known that I was on the Board, and that is only a day or two. They say, "We have had institutes and we want some more; we have had good times, and we learned something." I hope we shall get all we can possibly be allowed, in York county.

DR. A. W. HARRIS.

I have so little practical experience in institutes that I hesitate to say anything at all. I suppose, undoubtedly, we all agree that the institutes ought to be mainly just such as they have been. The past experience has, wisely I have no doubt, embodied itself in the results we have had. I have noted one or two things that may seem practicable, though I advance them with a good deal of hesitation, as experimental; a new idea must be experimental. It seems to me that the suggestion of the use of wide tires is very important. I cannot see why, if we take the proper measures, we may not keeep our roads a great deal smoother, at a very trifling expense. I think the subject of household economy, and matters of interest to women should receive a great deal of attention. As I have said in this presence before, it is not only important that a man should earn the money, but that he should spend it wisely, and the most of the money is spent by the women. A vast amount of work is done by the women, also, and I think we will do well if we help them to labor more efficiently and spend our money more economically. I think attention should be given to the raising of small fruits and vegetables for home use; I do not mean as a business, but for the increased pleasure in the home, which can be obtained at very little expense. And I have wondered why it would not be wise, at some institutes, to issue beforehand a summary of what is going to be said. Suppose you have an institute, and you put into the program that the speaker is going to defend two or three theses, or is going to tell us this, that, and the other. We find in the Station bulletins, on the third page, the conclusions that the man has reached. Possibly if something of this kind were in the programs, so that the people would know, for instance, that the speaker would say that you ought to have manure in your barn cellar, it would bring out a discussion which would bring out individual opinions. By giving little suggestions as to the conclusions the man was likely to reach, you might succeed in bringng out from the audience their own experience. I think that it is a wise suggestion that the members of the Board should be used, and not only the members of the Board but the farmers of the locality, so that they should give what ideas they have, and be called upon to defend them, and be taught to question them, in some cases. And then I have wondered whether it might not be useful to give some little time to the consideration of farm accounts. It surely is true in almost every line of business that a great many men make failures because they are not keeping accounts properly. They do not know which side of the business pays and which is a loss, and sometimes they do not know how to find out.

In the last place, I want to suggest what seems to me to be one of the most important subjects that can possibly be taken up, and that is education, especially agricultural education. There are provided in the State magnificent facilities for the education of young men, either in long courses or short courses, and it is lamentably true that the number who take advantage of these is very much smaller than it ought to be. And if we believe, and I take it for granted that we all do, that this is the basis for every other education, the Board of Agriculture can do nothing of greater advantage to the State than to be everlastingly advertising the advantage of agricultural education.

PROF. CHAS. D. WOODS.

I haven't anything very special to say. I wish that I could firmly believe that the interests of agriculture would be most advanced by having only members of the Board, and only practical men, talk at the institutes, because it would solve one problem which is of considerable importance to myself. You understand that it is no advantage to the Station, and is a possible disadvantage, to have its workers go away and talk to farmers. The Station is not educational in that sense. The government gives the money to the Experiment Station for the purpose of working out investigations. While it is of advantage for them to come in contact with men, and know what the problems are in the State that need to be solved, yet whenever a Station worker is somewhere else, he cannot be doing the work that the government intends. I differ in one respect in my opinion of what an institute should be. I do not believe that an institute in which a man goes in and tells the men exactly how to do a thing is of very much value. I do not think that an institute in which the farmers are told how to plow and plant a piece of corn to get the largest crop is exactly the ideal of an institute. My opinion is that an institute stirs men up and sets them to thinking, and when you talk to men on general principles, instead of individual topics, you are getting the best results, if you get any results. I do not believe that agriculture is a rule of thumb method. I do not believe it is possible for any man to tell anybody else exactly how to do a thing. There are some things in agriculture that perhaps I know better than some other members, and I am very confident that the members of the Board could give me a hundred lessons. I doubt if what Mr. Snow in Milo does would be suited to the conditions in York county. What is true on Mr. Snow's farm may not be true five miles away. What you are to do, in my opinion, is not to give exact directions for any kind of work, but to set men to thinking, point them to the sources from which they can get the best results that science is obtaining, and then trust to their good common sense to put into practice and get the best they can out of it. I believe it is to work of that kind that we owe the remarkable advance which agriculture has made in the last twenty-five years. There is an inspiration in what Brother

Buker has said,—a man coming before you and saying that he started on nothing and has succeeded; and just as that is an inspiration, so on the other hand, I believe that when a man who is imbued with the proper spirit speaks of the theoretical, if he does his business rightly, he is inspiring these men to try to do better things, to get hold of these ideas and put them into their own every-day practice. I believe that an institute, if it accomplishes much, must be a source of inspiration.

AROOSTOOK COUNTY.

JONATHAN BENN—Special attention should be given to dairying and stock-raising. The pasture lands of Aroostook, usually green throughout the season, offer special advantages to these branches of farming. They have been too much neglected in the past, and too many of our farmers are ignorant of the best methods and the tried experience of the progressive farmer.

More attention should be paid to poultry raising and how to make hens lay in the winter. There is a long period from December to April when there is a dearth of eggs in Aroostook. This ought not to be; the farmers' hens should lay the year round, even in Aroostook, and this subject should be discussed at all our meetings.

Above all, our discussions should take in the home life on the farm, how to make farm life more interesting, pleasant and happy. The farmers' wives largely attend our meetings, and they ought to have subjects discussed of special interest to their home life, things that interest them, that have been so much neglected. They have justly felt that their work, so essential to successful farming, has been overlooked by us and their home life and duties have not been appreciated as they should. This is a subject of vital importance and should have our best attention in our institute work.

There should be more attention paid by our organization to the smaller towns. Hitherto our work has been confined among the farmers at and near our large towns. Whenever we have had an institute in the "back towns," so to speak, it has been largely attended and a great interest manifested. It is new to those farmers and they eagerly listen to new ideas and digest the talks and put into practice the things they hear. It is the right of the smaller towns to be recognized, and we ought to consider them in the meetings appointed for 1900.

Not only should the smaller towns be remembered but the far northern towns and plantations should especially be favored. We should go as far north as Fort Kent, at least, as meetings there would be well attended. The greatest good to the greatest number of farmers, should be our motto for the coming year.

LINCOLN COUNTY.

J. M. WINSLOW—There is one thought that I have which I believe no member has touched on, which is of great importance to my county, and I do not know but it is of some little importance to other counties. We had a speaker from the college this fall, Prof. Gowell, who gave a lecture, telling us how he treated a worn-out field on his own farm in Bowdoinham years ago; and we need in our county, more than anything else, speakers who will stir up the farmers in tilling the land more, so that it will produce larger crops, and consequently more stock can be kept. I believe that is the line of work most desirable for my county,—the saving of all the plant food, more cultivation, the producing of larger crops of stock fodders and the keeping of more stock on the farm.

The report of the committee on pay-roll was presented, and after a slight amendment, was adopted.

Mr. MCKEEN—I have been very much pleased and gratified to hear the satisfaction expressed in reference to the institute work, and I want to endorse most heartily the suggestions that have been made along all lines, and to say that I want the members to suggest any speakers and any subjects, and, as far as possible, the time of holding the institutes. The time is something which we have to reserve more than anything else, but I want you to feel free, as you always have, and freer if possible, to suggest speakers and topics, and of course you all understand that the matter of locating the institutes is entirely in your jurisdiction. In relation to the suggestion made by Brother Holway of holding more institutes, I consider that really as the foundation of the successful work of the Board. I realize more than any of you, because I have been to more places in the work, the loss that comes by holding an institute in a place and then not getting around again for years and years, as he spoke of, at Hiram. All the efforts the members will make, by planning their meetings so that they can be held in conjunction with one another so that we may have more meetings, I shall be more than pleased to second. This year we have held eighty-three institutes, and, as I said, and I wish to repeat it, we are well within our appropriation. Of course the fiscal year and the Board year do not close at the same time. The fiscal year closes the last day of December, and all the balance unexpended at that time would lapse unless specific measures were taken to save it. This year, and last, warrants were drawn in favor of the State treasurer for the balance, to cover the expenditure of the Board up to the time of the annual meeting, and I think there is going to be quite a little left after the entire expense for the year 1899 is paid.

In relation to the matter of theory, I do not believe we always understand what we are talking about when we mention theory. I have the most supreme contempt for theory, theorists, etc., but I do not put down the talk of a man who has a scientific education, or a technical education, although he may have never hoed a hill of corn or turned a furrow,—I do not put down his talk as theoretical talk, in any sense of the word. It is simply the acme of common-sense, because it is what the man has obtained by years of thought and study. What I mean by theory and theorizing is for a man to talk about a subject of which he knows nothing from practical experience or technical training, and I believe in fighting entirely shy of anything of that kind.

In relation to the employment of the members, I shall certainly be glad to do so, as far as possible, and I certainly hope that every one of you will feel to prepare yourselves along this line. Experience teaches me that our people are coming to demand what may be called trained speakers, that we must get at something that comes from men who not only know their work but know how to tell it.

My experience teaches me that the nearer we get down to details the better results we obtain. Whether Prof. Munson, Prof. Gowell, or a farmer, is speaking, the nearer he gets down to specific work and the less he talks along general lines, the more readily the people listen, the more they ask questions, and the more interested they become.

I certainly feel to thank the Board for the interest you have taken, and for the very kindly feeling you have expressed during the meeting, in discussing the matter of institutes in the different counties.

On motion of Mr. Light,

Voted, To take from the table the motion made by Mr. Roberts in the early part of the session, and laid upon the table for further consideration. After being amended by striking out the word "broadly" and by adding that this committee shall report at the adjourned meeting in August, the motion was carried.

AFTERNOON.

A committee to take into consideration the present system of electing members of the Board, etc., in accordance with the motion of Mr. Roberts, was appointed by the chair as follows: John A. Roberts, E. E. Light, and F. H. Rollins.

Voted, That the secretary be instructed to send the elective members of the Board the usual amount of stationery, with the headings of the agricultural department, and envelopes, also blanks for the expenses of the members.

MEMORIAL ADDRESS.

HON. BENJAMIN FRANKLIN BRIGGS.

By J. L. LOWELL, Auburn.

Hon. B. F. Briggs was born March 8, 1831, at North Auburn. He was the son of Hiram C. Briggs and Hannah Alden Briggs.

He received a common school education, attending town school every winter until of age. In his boyhood, he worked diligently on his father's farm, and when 17 years of age, learned the shoemaker's trade at which he worked except when attending school. January 23, 1853, he married Sarah Gilbert Dillingham, who survives him.

After his majority until the beginning of the year 1854, he worked in the store and shoe manufactory of John F. Cobb. He then purchased a place at West Auburn, where he carried on farming operations. He also made shoes for various concerns, among them being A. C. Howard of West Auburn and Roak & Packard of Auburn.

In 1855-6, he manufactured shoes on his own account, buying stock and selling his shoes in Boston. As the financial panic of 1859 approached and a decline in the business was evident, he stopped manufacturing for himself, and carried on his farm and made shoes for other concerns. In 1861, he moved to Auburn and engaged as foreman of the sole leather cutting room with Roak & Packard. In 1864, Mr. Packard having bought Mr. Roak's interest, he became a partner of the firm of E. F. Packard & Co. In 1873, he personally superintended the building of the Packard & Briggs brick factory on Railroad Square.

In 1882 he discontinued the manufacture of shoes and moved to the well-known Maple Grove Farm, which he had purchased several years before. From that time until his death he was engaged in general farming and the breeding of Jersey cattle and gentlemen's driving horses.

He was a member of the Elm Street Universalist Church, in which he took an active interest and was a most loyal, generous supporter.

In 1876 he was elected a director of the First National Bank of Auburn. In 1889 he was elected a director of the Shoe and Leather Bank, Auburn. He remained a director of both banks until his death. He was one of the directors of the Whitman Agricultural Works, established in 1889, and for several years its president.

In 1886 he was elected treasurer of the Maine State Agricultural Society, which position he held for three years.

He was elected member of the Maine State Board of Agriculture in 1890, and continued to be a most useful member until his death. In 1892, he was president of the Board. In the same year, he was appointed a trustee of the University of Maine by Governor Burleigh, to which position he was again appointed in 1897, by Governor Powers.

He was for several years president of the Androscoggin County Agricultural Society.

In 1894, he was elected to represent Auburn in the State legislature and was re-elected in 1896.

He was an active member of the Grange, being a member of the Executive Committee of the State Grange and treasurer of the County Grange.

After his retirement from active work of the shoe manufactory, he built a most beautiful home at Maple Grove and it was here that his domestic happiness was fully realized. Everything that a generous heart and a willing hand could procure, was brought into this home that the wife who was in delicate health might have every comfort. He had but one child, Mr. F. H. Briggs, who will take up the work so much loved by his father and will put forth every effort to make the field blossom as the rose.

His knowledge of agriculture and of stock raising was based not upon theory or upon what someone else had done, but it was obtained from actual practice in the fields and with his herds, where he spent all of the time which could be spared from his other business cares.

In the busy seasons on the farm, he was found early and late actively engaged with the men, superintending every detail. Thus he was enabled to accomplish great results. On account of his great experience along almost all lines of work and his rare good judgment, his advice was much sought on matters of every kind. No enterprise in which he took an interest or in which he was engaged was ever merely half done. He believed in the old saying that "whatever is worth doing at all, is worth doing well."

Our beautiful city of Auburn owes its prosperity as much to Mr. Briggs as any one man. Every new industry, every improvement in streets and public buildings, in fact, everything that would build up and make our city a better place to live in, received his hearty endorsement and financial aid.

Very few men had as many true friends in every walk of life. His varied career as farmer, manufacturer and in public life gave him an acquaintance with men all over the State and New England. With him, once a friend was a friend forever. But it was as a neighbor, a true friend and a faithful Patron of Husbandry, that I knew him best.

We sometimes speak of our neighbor as a good man, but when we say he is a good neighbor in every sense of the word we mean something more than that he is kind and obliging. An invalid lady, a near neighbor of Mr. Briggs said, a short time ago, that there was no one she missed so much as Mr. Briggs; he always had the same pleasant smile and kindly greeting, no matter what his own trials and vexations might be. His earnest desire was to see others happy. Another says, "We miss Mr. Briggs so much in every way." "Yes," I replied, "and we shall miss him more and more as the years go by."

Mr. Briggs became a Patron of Husbandry at about the time I joined the order. It is in this work and in the interest of our agricultural societies that we have worked most harmoniously together. Nothing that was for the best interest of our noble order was passed lightly by him. Everything that would assist in the building up and improvement of the American farmer and his family had his sympathy, coöperation and aid. While we shall miss his kindly greeting, his pleasant face and words of encouragement, yet it is in his home that the bereavement comes with greatest force, and to his wife and family, the members of the Maine Board of Agriculture extend their sincere and heartfelt sympathy.

He is not dead! 'Twas but a solemn stillness,
A peaceful folding of the hands to rest;
The closing of the eyes in gentle slumber,
And he was blest!

POTATOES AND WHEAT IN AROOSTOOK COUNTY

By Jonathan Benn, Hodgdon.

The fame of Aroostook potatoes has become world wide. This fame is not due to the advertiser, the boomer or the dealer. Aroostook potatoes have a real superiority, that has brought them to the front—a dry, ripe, mealy nature, and a fresh pleasant flavor that is not possessed by those grown in any other section of the country. As a land adapted to the raising of potatoes, Aroostook is without a rival.

The question is often asked, "Why do Aroostook farmers plant so much land to potatoes and so little to other crops, why not engage in a more diversified farming?" This question is easy of answer to one who farms in Aroostook. There, potatoes are most easily grown, the most sure crop, the most profitable crop. To be sure there are years when good crops in other sections of the country bring down prices in Aroostook, yet on the whole the average price is good and the potato starch market always takes care of the home market when there is no export trade.

What is to be the future of potato growing in Aroostook? There will certainly be more and more planted every year. New methods of planting and cultivation have made it possible for one or two men and a team to care for immense fields of potatoes during the growing season, and the cost of production has constantly diminished.

The Aroostook farmer is not wholly wedded to the potato. Many years ago, wheat was the staple crop of Aroostook. The cheapness of western flour, and the crudeness of the old-fashioned grist mill have had a tendency to cause the farmer to neglect the raising of wheat.

Those who have grown wheat in Aroostook during the last three or four years have been happily surprised by the absence of its insect enemies, its ripe, plump heads, the large quantity grown on the acre and the excellent quality of the flour produced when properly ground.

There is no good reason why Aroostook cannot become as famous for her wheat as she has been for her potatoes. The wheat grown there has no superior, and it can be grown, ground and sold as cheaply as any that can be imported. Unless the pulp mill shall deprive Aroostook of her forests, and thereby change her climate, this "Garden of Maine" will continue to lead the world in her wonderful crops of the "Irish potato" and "the finest of the wheat."

FAIR MANAGEMENT.

By Arthur N. Douglass, Chelsea.

In briefly considering the subject of fair management, I wish to confine myself to a discussion of the management of a strictly agricultural exhibition of about the magnitude of a county fair. Horse racing is generally made the principal attraction at our county fairs, yet I am persuaded that there are other lines which might be followed with better success, and with a like amount of money and equal exertion expended in other branches, more satisfactory results would be obtained. I believe it is common knowledge that when an association exists mainly for the purpose of conducting horse races, ultimate failure is its portion.

In the first place, an agricultural society should have a purpose other than the attainment of mere financial success. The best efforts of those in charge should be so directed as to encourage not only the production of the best of a kind, but *the best kind.* Let the premium list be made up with this end in view. A society should not be content simply to reflect the products of the farms in its jurisdiction, but should stimulate by offering large premiums, the production of the most profitable animals and crops. Substantial premiums should be offered to be competed for by the boys and girls on the farm. There is no display at our fairs which presents such an encouraging feature as do the exhibits which represent the employment of the youth. A society may do much in this way, by clever management, to build up a class of exhibitors that will insure the future success of the fair along those lines.

The premiums should be paid as promptly as possible. Exhibitors feel that they have well earned their premiums and are entitled to their recompense.

The gambling games and schemes devised to defraud innocent people are a constant menace to our fairs and continued vigilance must be exercised by those in charge to keep them in check. When all people learn that simple but infallible truth that it is not possible to beat a man at his own game, then these smooth gentlemen will have no more business at a country fair than they would at a meeting of commercial drummers.

If there is anything that contributes to the success of a fair more than good weather, it is good will. The management must treat people fairly and honorably, not attempting the least deception. I would have all exhibits which their character would permit, judged without any distinguishing mark, and I think it advisable if the society can afford it, to employ competent judges living without the jurisdiction of the fair.

Secretaries must learn, also, to appreciate the value of the good will of newspaper men. The man with the pencil who is writing up the fair for his paper has the power to give it a good showing, or to convey the impression that it was a tiresome, insipid exhibition. These reporters are simply human, and whatever is offered them in the way of courtesies and attentions are esteemed by them and are reflected in their reports. The good will of newspaper men is worth more to a fair association than a surplus in the bank.

Now just a word as to methods of advertising. Of course all will agree that judicious advertising pays. The people must be notified early of the dates selected and every list of fairs that is published should include yours. My experience teaches me that the best results are obtained by advertising the dates and general attractions with lithographed posters put up in places where they can remain from three to four weeks in advance of the fair. While for spreading the knowledge of the program in full and such other details as are needful, space in the newspapers I believe to be superior. Those who are entrusted with the direction of an agricultural exhibition, and particularly the secretary, on whom, more than anyone else, depends the success of the enterprise, should be constantly on the alert for new and good ideas in regard to fair management.

BUTTER PRODUCTION.

By E. E. Light, Union.

The Board of Agriculture has consistently (and wisely we believe) advocated such methods of agricultural industry and production as will best preserve and increase the fertility of the soil, and bring the largest remuneration for labor, skill, and capital applied to this pursuit.

We believe it can be shown clearly that butter production retains all the fertility of the soil, and may aid in increasing its fertility, more than almost any other production will do.

Grass is the most abundant and the most widely diffused product of our State, and is an article of large commercial importance. It may be marketed as baled hay or it may be converted into other forms and be disposed of. Which method shall this Board advise?

Recently, I hauled to the station with a 900-pound horse, $255 worth of butter in one load. At the same time I was moving hay to the same station for shipment, and it required forty horses to truck the same value in hay, or it cost $1.25 to truck the butter, and $27.50, the hay.

The R. R. freight bill to the same point of shipment was $1.10 for the butter, and $20.00 for the hay. Pressing the hay for suitable shipment cost $44.00; while making the butter—manufacturing, or preparing it for suitable shipment and sale, at two cents per pound, would be $18.00.

Chemists inform us that at present prices of ingredients, $129.00 worth of fertility was taken away from the soil in the hay; in the butter, four cents' worth.

Can we be in doubt for a moment which course to advocate and which to discourage? Does not the above coincide approximately with the experiences of individuals and communities, and with our observations in dairying sections, and hay selling sections, regarding the general prosperity and the general fertility of the farms?

Had that hay been converted into butter and skill applied in its manufacture, what could we have reasonably expected?

Fed exclusively on that hay, at the rate of thirty pounds per day, it would have kept seven cows 200 days—or from November first to May twentieth; and to have produced the load of butter in the comparison, the cow should make 228 pounds per year, or the seven cows should make four and one-half pounds per day for the 200 days, which is not an extraordinary or unusual yield. Allowing skim-milk and manure for compensation for tending cows, we have also the difference in the condition of a farm or a community; one fertile, productive, improving; the other run-out, producing less each year in quantity and poorer in quality, and decreasing in value.

Butter-production also affords many opportunities to reward skill in breeding and in feeding, and in the manufacture of the concentrated article that will always be in demand, and the present outlook is more hopeful than for many years past.

The demands for the products of the cow have expanded wonderfully in the sweet cream trade, ice cream sales, etc.

Great numbers of butter factories in this country have stopped because of the sweet cream demands, and this is no fad that will soon run out, but a sound, permanent demand that is destined to further increase.

MILK PRODUCTION.

By W. H. Snow, Milo.

There is no product of the farm that requires so much care and attention, and that is so delicate and difficult to handle as the product of the cow.

The first requisite is the cow. Take whatever breed you think best adapted to your conditions. You must decide that after a thorough trial, and then do your best to improve on that. Having secured the cows, give them care and treatment to secure the best results. Let them have a good roomy stable, well lighted and ventilated. Not many of us can have our stables sheathed and polished, but we can keep them clean and free from unwholesome odors. Give the cows plenty of good bedding to make them comfortable and contented; treat them kindly and keep them free from excitement and fear. We find that kindness goes a long distance towards filling the milk pail. Too much attention cannot be given to the milking. Some persons prefer people who sing while milking. We have never tried this ourselves, fearing that the result might be the same as caressing them with the milking stool.

An object lesson of this kind came to notice in our own stable a year ago. One of the best cows in our herd was milked by hired help. We think there was no love lost between the cow and man. We never knew him to abuse her in any way, but he kept her irritated and uneasy. The result was, she was dry the first of December, and was not due to come in until the first of April. This year she comes in again the same time and is giving a satisfactory amount. During the past season, we did not have a cow in our herd that we could not catch in the pasture any time. By looking after and thoroughly repairing the fences, we have had no trouble in keeping our cows contented.

Our herd is a mixed one. While engaged in selling cream, we tried to build up a herd of Jerseys. We have changed them to some extent, but we have some good ones left. We have Durhams, nearly full bloods, and Holsteins. I think that we prefer the Durhams for our business. We have not as yet been able to go into the more minute details, as weighing and keeping an account with each cow. We will give our method of caring for our herd and caring for and marketing their product. Will say that a prejudice exists to such an extent that we have not yet a silo, although realizing the profit of one.

We have a pasture so good that during the summer time, we do not feed any grain. As the feed begins to dry up we feed sweet corn; have used mostly Stowell's evergreen, but shall plant more of the smaller varieties. We follow this with hungarian, oats and peas. After the cows come to the stable, we feed clover hay, oat hay and hungarian. For grain, we feed corn and oats ground together, the oats having some buckwheat in them, two quarts of the mixed meal, two of shorts and one of gluten, twice a day. We water twice a day, the cows going about ten feet from the stable door (under cover) where the water is pumped for them. They have a chance in good weather to go out into the yard. We think the exercise does them good.

We deliver our milk every morning, making about fifteen miles. Have missed but one trip since we started, August 15, 1898. The milk as soon as drawn from the cow is carried directly to the milk room, where it is strained into the can, the same as when we were selling cream. The morning's milk is strained, and placed in the tank of ice water until cooled. It is then thoroughly mixed and put into two quart, quart, and pint glass jars. Partitions are placed in the boxes so that each jar will be by itself. The boxes are made of one-half inch pine boards and are light and convenient to handle. They are filled in the milk room and carried to the cart. We have two jars for customers. A piece of clean white wood of some kind is fastened to each of the jars, with the name of the customer upon it, each customer preferring to wash his own jar.

AGRICULTURE IN WASHINGTON COUNTY.

By E. F. ALLEN, Columbia Falls.

The cultivation of the soil has not been in the past, nor is it at present, the leading industry of this county. The staple products are, or have been, lumber, ships and granite. Within a few years, the fisheries have grown to large proportions and now furnish employment and sustenance to many of the dwellers by the sea.

The old question, "Will farming pay?" is still often answered in the negative by men who do a little farming and very little besides. But although the farm is neglected and abandoned by many, there are yet those who have faith in it and are showing their faith by their works.

There are many men in Washington county who, unaided, have made good homes, supported their families and educated their children. Their bank accounts may not be very large, but quite a few have something saved for a rainy day.

Of the products of the soil, first in value is the hay crop, nearly all of which is used in the county. Many times more than the amount now grown might easily be produced, as there is much natural grass land here. On nearly all the rivers, acres of intervale land produce a good crop, without any dressing, every year, and these intervales only need cultivation to be as productive as any land in the State. Besides, on these rivers, from the head of tide water often for many miles to the sea, are marshes, diked and otherwise, that without any failure, produce abundance of marsh hay that can be fed to young stock with profit. The potato crop is as sure and the quality as good as anywhere in the world. Barley and oats are profitable crops. Turnips never fail, and cabbages need only the same care here as elsewhere. Peas, beans and corn are grown for early market and all ripen in the season.

Not many years ago, it was thought that apples, pears, plums, etc., could not be grown successfully here, but a visit to the West Washington County Fair at Cherryfield, will convince any one that Washington county may become a fruit growing county.

No account of this kind would be complete without mention of the blueberry canning industry in the towns of Cherryfield, Harrington and Columbia Falls. A very accurate statement of "The Blueberry in Maine" by W. M. Munson, may be found in Agriculture of Maine, 1898, Part 2nd, pages 164-172 inclusive. The total value of the canned product that year was estimated at $28,500. In the season of 1899, just closed, it is estimated that the Wyman factory at Cherryfield put up 11,000 bushels, A. L. Stewart's factory, 7,000 bushels, Burnham and Morrill, Harrington, 7,000 bushels, L. A. and A. R. Logie, Columbia Falls, 7,000 bushels, and J. A. Coffin, Columbia Falls, 7,000 bushels. This would make a total of 39,000 bushels in the three towns, and as $1.28 per bushel was paid for berries at the factories, the value of the fruit would be nearly $50,000. Add to this the wages paid at the factories and the money ceived for fresh berries shipped in crates, cases, carting, etc., and it will be seen that the amount of money distributed is no small sum.

Formerly, the spring burn was all the cultivation thought necessary, but it has been found that by clearing off the brush where it is necessary, more than double the berries may be gathered. An old field on a sandy or rocky hillside will give the best results; in other words, clean culture will pay in raising blueberries as well as in raising corn. I have made no mention of the cultivation of small fruits, among which, strawberries, blackberries, raspberries and cranberries can be raised with profit in this county.

In nearly every town are men making a living in the poultry business and there is no limit to the demand for fresh eggs and broilers. We have unequalled facilities for raising sheep ,especially on the islands and capes on the coast.

There is need of creameries and starch factories in the county, and could we have these and the cattle ranch that is talked of (and all these industries are believed to be practicable) then there would be no doubt in regard to the future of agriculture in Washington county.

Finally, I believe that farming in this county can be made profitable and successful in any and all of the branches named, by giving the same diligence and care that are essential to success in any other business.

INCREASING OUR FARM RESOURCES.

By J. M. Winslow, Nobleboro.

The foundation of all farm operations is plant food. Our own existence, as well as that of our farm animals, depends wholly on the growth of plants from the soil. First of all, we seek for food, clothing, and homes for ourselves and families; and as we look back over the past, we find there has been an increasing demand on the farm for something more than mere existence. We want, and our families want, more and more of the so-called luxuries of life. Let us stop and think how we can increase our farm resources. Begin at the foundation by saving all the plant food on the farm. We cannot manufacture plant food; all we shall ever have, we now have. It is our place to gather and apply to our soil (which we are constantly robbing) as much, yea, more, plant food than has been taken out by the crop. Having done this, what then? We have increased our plant growth. We have more corn, more hay, better filled bins, and must have more stock to feed. Get another cow, you increase your income by so doing. Keep on, do not stop until you have reached the limit of farm fertility, which is a long way ahead. I believe we should have the best of farm implements to cultivate our soil with, and work it more, and break up our heavy soil to make it light and porous, and so increase its productiveness, and also the resources of the farm. Never buy what you can raise yourself. Raise your own cows, sheep and pigs. When you sell, sell mature animals. This practice will surely lead to an increased effort to raise more stock fodder and increase farm resources. Another way of increasing farm resources is to enlarge on the small flock of poultry kept on almost every farm in the State. It requires but a small outlay to double up the number kept this year, so as to have twice as many next year. With good care, intelligently handled and marketed, they will surely increase one's income. The dressing from a flock of two hundred hens will grow a half acre of corn, which gives a good start to keep another cow. By this small and almost overlooked increased supply of plant food you can increase the productiveness of the farm. As often as you can add two cows to your herd, you can keep another pig at a good profit. Had I, in my early farming, seen things as I do now, and started on this gradual growth, I might be doing double the business I am doing to-day on the same farm I have always tilled. I believe there is a chance for a constant growth, if the young men will profit by the experience of older farmers, and get good counsel as they would if they were to go to law on some important suit, and stick to business while young and full of life and vigor, have some ideas of their own, and keep up with the times.

We want more than an existence, we want to grow and flourish in our business and double the product of the farm. Are we standing still, not advancing a single step? I say no! We have better schoolhouses, and better schools in our country towns than when I was a boy. Boys know more now about the ways of the world at fifteen years of age than they did at twenty, forty years ago in our country towns. Most of the towns in the State are well supplied with daily and weekly papers. The small farming town in which I live has no less than five places where daily papers are for sale, and nearly every family has been well posted on all the great questions of the past year or two. When I was a boy, there was not a daily paper for sale in town and all did not have weeklies. All this causes the young man to want more, and we have more. The farmer's family is better clothed now than they were when I was a boy. The shoes the boys and girls wore when I went to school in the little flat-top schoolhouse did not have to be taken to a cobbler to mend. A rag on the sore toe, or a plaster where the outside had been punctured, was all done at home, and this from April to November. This is a rare sight now, but it is not rare to find school children who wear out two and three pairs of boots in the summer and one or two pairs of rubbers for the wet weather. Surely it costs more to live now than forty years ago in the country. How do we do it? We have increased the resources of the farm, and must continue so to do along the lines I have already indicated. We have better teams, more farm machinery. Everything goes to show gradual growth and general prosperity on the farms of the State. Then let us take courage, study our business (for we have a business now, you know; we used to be "nothing but farmers"), take on the gradual growth like the plants we grow from the mother earth, or the large ox we have grown from the many balanced rations we have fed him. It has been a blessing to the farmers of my little town that it is a farming town. We have therefore learned to depend on the farm for our income. I can pick out ten or a dozen farmers in that little town who have a little book, entitled "Augusta Savings Bank" which they keep to study when they feel the blues coming on.

If by this little paper I can start a thought in some of the young farmers of the State by which they may profit, the end I sought is accomplished.

Mr. HOLWAY—While at Skowhegan the other day, Secretary Clarke suggested the idea that the Board of Agriculture and the State Grange should have a day at the next State Fair entirely their own, and wanted me to lay this matter before the Board. I would like to have you discuss the matter.

Mr. ROLLINS—This is a subject that should interest us, I think, and as it is a perfectly new idea to me, and I presume to others of the Board, I would like to hear more extended remarks from Brother Holway in relation to the matter.

Mr. HOLWAY—Perhaps the secretary could give you more detailed information as he has been at work on this line in former years.

Mr. McKEEN—The matter of holding an evening meeting of the Board with the State Fair was begun quite a good many years ago. In fact, one of the first meetings of the Board I ever attended was an evening meeting at the State Fair. These meetings have been continued every year since. We have had some of the largest and most interested audiences at these meetings that we have had anywhere. I think the Board never has attempted to hold a day meeting, but it has been in the premium list of the fair for many years that Wednesday evening we should have a meeting, addressed by members of the Board or others, and people come in who are camping on the ground or in cottages, and some from the city. The only thing in the way of holding such a meeting is the lack of an audience room. They put up a tent and give us free music, but their facilities for holding the meeting are very poor. Last year we got the speakers there and the tent was blown down, and the speakers were obliged to go home before the meeting could be held. For myself, I should be very glad indeed to follow any instructions the Board may give for uniting with the Grange and holding an all day meeting there, or in any way that you may choose.

Voted, That the matter of holding an all day meeting at the State Fair in conjunction with the State Grange be left with the executive committee of the Board, with instructions that they confer with the Master and executive committee of the State Grange and the secretary of the society.

Mr. McKEEN—There is a matter that I want to mention to the Board, in relation to institute work, or what perhaps may be called dairy instruction work. I have thought that it might be possible, if the members were favorable, in quite a good many of the counties in the State, to hold two days' dairy meetings. For instance, we could go into Oxford county for a two days' meeting and into Androscoggin county for a two days' meeting, with the same party, in one week, holding the meetings Tuesday and Wednesday, and Friday and Saturday. And the purpose of these meetings would be dairy instruction. We could make it a matter of instruction to the dairymen, inviting the representatives of the different separators to go with us, and having the first day devoted to the separating of the cream and the preparing of that cream for churning, and the next day devoted to churning the cream and putting the butter up in proper form, having a man with us to do this work. We could have such lectures in connection with the work as should seem best. The matter of holding two days' institutes is something that I think perhaps the Board has not considered as much as it ought. We have held two days' institutes with excellent results in Washington county, and once or twice in Knox county. We did succeed in Washington county at one time in getting some separator cream and taking it into the meeting, and tempering it, ripening it and churning it; and then we had a local committee appointed, and they pronounced the butter to be all right, and I think very much good came out of that meeting. I do not wish you to commit yourselves on this question, but to think it over and see what you think of it.

Mr. ROBERTS—Can you give us any idea of the probable expense?

Mr. McKeen—We would want one speaker, Prof. Gowell probably, the member and myself, and a butter maker. That, I think, would be all of the force that we would need. I think the separators and churns would be furnished by the dairy supply firms. The expenses would not be heavy.

Ques. What season of the year would you suggest?

Ans. We have had excellent success in holding similar meetings in June, and August is a good month. I would not hold them in the coldest weather, but when you could get out-of-doors if you wanted to, and not be uncomfortably cold.

Mr. Roberts—Do I understand, Mr. Secretary, that these dairy meetings would be held in a hall, and the milk and cream brought there?

Mr. McKeen—Yes; of course you would have to have a starter. We would buy the milk and show the care of the cream and the running of the separator, and the next day we would churn the cream, and test any milk or cream that might be brought in, also testing the buttermilk, and doing any work of that kind that might be of interest to the meeting. We would have such lectures as we could to advantage.

Mr. Holway—I am satisfied that my county would like such a meeting, and would do all they could to make it a success, if the Board should see fit to adopt the plan.

On motion of Mr. Light,

Voted, That the thanks of the Board be extended to the railroads of the State, and to the Augusta House for reduced fares and rates.

On motion of Mr. Rollins,

Voted, That this meeting now adjourn to meet at this place on August 21st at ten o'clock.

Adjourned.

CATTLE COMMISSIONERS' REPORT.

There have been 114 cattle, 38 horses and 1 hog destroyed. Total, 153. The average amount received by owners of animals destroyed, including cattle and horses, was $20.42 each.

There has been a decided increase in the work of the Board during the year of 1899.

There seems to be an increased confidence among the live stock owners in the work of the Board.

This state of affairs can only be explained by the fact that cattle owners have become better educated to the existing disease and better realize the financial loss to them if diseased cattle are allowed to remain in their herds.

The prejudice against having their herds examined is passing away, and there is a growing sentiment among the live stock owners in favor of suppressing tuberculosis in our State.

It is fortunate for us to be able to report that of the several contagious diseases that afflict domestic animals the commissioners have had only two to deal with, namely tuberculosis and glanders.

Tuberculosis exists among cattle in all the thickly populated countries upon the globe. It exists to the greatest extent in the United States along the Atlantic coast. Prairie and mountainous sections are practically free from it. Every state in our country has its sanitary laws, and nearly every state has a direct law in relation to contagious diseases among cattle, and it is well to note that those who have the work in charge are carrying it on practically upon the same lines.

HOW THE WORK IS DONE.

The commissioners make examination only upon written application of the owner or boards of health or veterinarians.

It would be impossible to do more under the financial limitation of the Board. It is the sense of the Board that compulsory measures do not enlist co-operation of the owners of live stock and without co-öperation the measures directed against tuberculosis cannot be successful. We believe that the most essential agency necessary to obtain the co-operation that is needed is to more generally disseminate knowledge of the facts in regard to the disease and to prove to the owners that they are fairly treated by the State.

Frequently owners complain that they are obliged to lose one-half of the appraisal according to the law. The commissioners are led to believe that the owners of condemned animals receive as much and even more than owners do in other states where the appraisals are made upon what the animals look to be worth at the time of destruction. In Maine animals are appraised upon the value of what they would be worth if they were healthy.

The state of Massachusetts pays the full appraisal, and the average price paid to the owners of six hundred cattle destroyed during the last six months of 1899 was $21.60 per head.

The limit of appraisements in Pennsylvania is for unregistered stock $25.00 and for registered stock $50.00, just one-half what the limit is in our State. Yet it occasionally seems to be a hardship where cattle are subjected to the tuberculin test, as the test will call out the mild cases as well as the bad ones, yet upon the whole we think there is no reason for complaint on this line.

TUBERCULIN TESTS.

The Board does not test cattle themselves; they consider that it is the veterinaries' business and they are the proper agents through which this work should be done. Neither do they order tests to be made. Testing is only done by the owners employing veterinaries on their own account, and occasionally by the advice of the commissioners, and then only by the owner's consent, the owner agreeing to pay for all animals proving to be sound and the State paying for all those diseased.

Public opinion seems to be crystallizing about the leading facts in relation to tuberculin tests. There have been many extravagant statements made, some of them coming from sources that are looked upon as reliable. The facts in regard to tuberculosis are important, and it is detrimental to the public and also to our live stock interests, to exaggerate them. It is also injurious to minimize them.

It is a recognized fact that tuberculin is not infallible, but in the hands of careful men its errors are few. In cases where tuberculosis has existed in a herd for years, the owner occasionally losing an animal, living in the herd all through the different stages of the disease, the only method to be pursued to clean up the herd and stamp out the disease upon the premises is by the tuberculin test. The commissioners have recently cleaned up a herd under these same conditions. The owner employed a veterinary to test five cows, all of which reacted and were condemned. The post-mortem disclosed the following results: two showed the disease to a very marked degree, two to a marked degree and one to a very slight degree. This caused the owner to complain and object to the tuberculin test. Two more cows of the same herd were tested and both reacted and were condemned. The post-mortem of these two cows converted the owner, and five young cattle were tested. Three reacted and were destroyed. This consisted of the entire herd. The ones that did not react were cattle recently brought in from outside herds. This is only one case with many others that have come under the observation of the commissioners.

Tuberculin is not infallible but it is far reaching. It is a firmly established fact that it is the most successful means of detecting tuberculosis among cattle that is at present available, if handled by careful and experienced men.

It was conceded by the Cattle Commissioners of Massachusetts, Connecticut and Rhode Island at the New England Cattle Commissioners' Conference held at Boston on December 8, 1899, that Maine cattle were freer from tuberculosis than cattle from any other New England state. This record should be gratifying to the breeders and dairymen of our State, coming as it does from such a reliable source. This knowledge was obtained on account of Maine being a seller of dairy stock and the three named states purchasers.

Nearly 13,000 cows have been shipped out of Maine into the markets of these states during the year of 1899, selling upon an average of $40 each, bringing to the farmers of our State nearly one-half a million of dollars. This, in connection with nearly four millions of dollars worth of dairy products produced from our dairy herds this last year and nearly all sold in the New England markets, should stimulate the farmers of our State to a higher appreciation of our dairy interests and to realize the fact that no higher qualification could be stamped upon our dairy products than for the consumers to know that they are produced from healthy herds.

The total valuation of our domestic animals at the present time is nearly $12,000,000, and it is an interest well worthy of being taken care of and there is no one so responsible for the health of our live stock as the owners themselves, hence it becomes the duty of every breeder and owner of domestic animals to throw around them all the safeguards possible and always be on the watch. It would be unwise for us to say that an animal in an advanced stage of tuberculosis could be cured. She cannot, and as soon as discovered should be removed from the herd. Sunlight, pure air and cleanliness are enemies to tuberculosis, and the more sunlight, the better ventilation and the more care is taken in keeping stables whitewashed, clean and pure, the less liable we are to have a case of tuberculosis developed in our herd. And in order to retain the good name of our State we advise as remedies for tuberculosis: First, close examination; second, the removing of all suspicious animals from the herd; third, an abundance of sunlight and sufficient exercise, good ventilation and clean habitation, and co-operation with the Cattle Commissioners.

GLANDERS.

During the past year there have been thirty-eight horses condemned and destroyed, diseased with glanders. This seems too many, to be in proportion to the number of horses in our State as compared with some of our neighboring states.

The disease has been found in different sections of the State, and generally among team or work horses. The veterinarians of the State should be quick to recognize this insidious disease and prompt to report it to the commissioners. The public should be alive to the importance of eradicating it, it being considered more dangerous to man than tuberculosis, and at least not give it a chance to spread.

It is the public sympathy and co-operation that all sanitary measures need in order that the work may be carried on with efficiency and economy.

Our quarantine law is still in force and while no cattle are allowed to enter our State without a permit from the commissioners yet there are some smuggled in against the law, in some cases causing the commissioners some trouble in hunting them up and making examinations. We consider this an important factor in keeping our herds healthy. There is no New England or Middle State at the present time that allows cattle shipped into that State without a certificate of health or being subjected to a critical examination after being brought in. If any state did not require it, it would be the dumping ground for all diseased cattle in the surrounding states.

Disinfecting the stables is considered to be very essential by the Board wherever one or more animals have been found diseased.

There are several different kinds of disinfectants, all good under certain conditions. We find by looking over the report of the Secretary of the State Board of Health, and also by personally consulting with him, that certain disinfectants are only good for certain diseases, and by his advice we recommend the following solution which is considered perfectly harmless, containing no poisonous matter, and is also very reasonable in expense.

Solution of formaldehyde (formalin): Six ounces to one gallon of warm water.

It is the intention of the Board to see to it that in every case where tuberculosis or glanders is found the stall and manger shall be thoroughly disinfected with formaldehyde solution.

F. O. BEAL,
JOHN M. DEERING,
F. S. ADAMS,
Commissioners.

FIFTEENTH ANNUAL REPORT

OF THE

Maine Agricultural Experiment Station

ORONO, MAINE

1899.

The Bulletins of this Station will be sent free to any address in Maine. All requests should be sent to

Agricultural Experiment Station,

Orono, Maine.

STATE OF MAINE.

A. W. Harris, Sc. D., President of the University of Maine:

SIR:—I transmit herewith the Fifteenth Annual Report of the Maine Agricultural Experiment Station for the year ending December 31, 1899.

CHARLES D. WOODS,
Director.

ORONO, Maine, December 31, 1899.

MAINE
AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE.

THE STATION COUNCIL.

THE STATION STAFF.

* Resigned June 30, 1899. † Appointed July 1, 1899.

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ANNOUNCEMENTS.

THE AIM OF THE STATION.

Every citizen of Maine concerned in Agriculture, has the right to apply to the Station for any assistance that comes within its province. It is the wish of the Trustees and Station Council that the Station be as widely useful as its resources will permit.

In addition to its work of investigation, the Station is prepared to make chemical analyses of fertilizers, feeding stuffs, dairy products and other agricultural materials; to test seeds and creamery glass-ware; to identify grasses, weeds, injurious fungi and insects, etc.; and to give information on agricultural matters of interest and advantage to the citizens of the State.

All work proper to the Experiment Station and of public benefit will be done without charge. Work for the private use of individuals is charged for at the actual cost to the Station. The Station offers to do this work only as a matter of accommodation. Under no condition will the Station undertake analyses, the results of which cannot be published, if they prove of general interest.

INSPECTIONS.

The execution of the laws regulating the sale of commercial fertilizers, concentrated commercial feeding stuffs, and agricultural seeds, and the inspection of chemical glass-ware used by creameries is entrusted to the Director of the Station. The Station officers take pains to obtain for analysis samples of all brands of fertilizers and feeding stuffs coming under the law, but the organized co-operation of farmers is essential for the full and timely protection of their interests. Granges, Farmers Clubs and other organizations can render efficient aid by reporting any attempt at evasion of the laws and by sending, early in the season, samples taken from stock *in the market* and drawn in accordance with the Station directions for sampling. In case there should be a number of samples of the same brand sent in, the Station reserves the right to analyze only in part.

STATION PUBLICATIONS.

The Station publishes 10 to 12 bulletins each year covering in detail its expenses, operations, investigations and results. The bulletins are mailed free to all citizens who request them. The annual Report is a reprint of the bulletins of the year and is bound with the Report of the Board of Agriculture and distributed by the Secretary of the Board. This combined report can be obtained by addressing the Secretary of Agriculture, State House, Augusta, Maine.

CORRESPONDENCE.

As far as practicable, letters are answered the day they are received. Letters sent to individual officers are liable to remain unanswered, in case the officer addressed is absent. All communications should, therefore, be addressed to the

Agricultural Experiment Station,
Orono, Maine.

The post office, railroad station, freight, express and telegraph address is Orono, Maine. Visitors to the Station can take the electric cars at Bangor and Old Town.

The telephone call is "Bangor, 27-3."

Directions, forms and labels for taking samples, of fertilizers, feeding stuffs and seeds for analysis can be had on application.

Parcels sent by express should be prepaid, and postage should be enclosed in private letters demanding a reply.

Remittances should be made payable to the undersigned.

CHAS. D. WOODS, *Director*

FEEDING STUFF INSPECTION.

Samples of the feeding stuffs coming under the inspection law were drawn by the inspectors in November, 1898. The results of the chemical analyses follow. A discussion of the results of some of the analyses will be found on pages 18 to 21.

The law is working very satisfactorily indeed. There are practically no goods sold which are not properly guaranteed. That the law is keeping out low grade goods is evidenced by the following from a letter received a few weeks since: "You will please print tags as ordered for x x x x x Mill and send same by freight instead of express. We have discovered that the meal we anticipated shipping into Maine market was not of sufficient quality to meet requirements of your State. We have, therefore, concluded not to ship as anticipated. We will, later in the season, have a very nice grade of meal at x x x x Mill at which time we will place same in Maine market."

FEEDS LOW IN PROTEIN.

Very few farmers can afford to buy feeds low in protein and high in carbohydrates at any price at which they have been or are likely to be offered. The farmer should grow all the coarse feeds that he needs. Oat and similar feeds are very much like corn stalks or oat straw in composition. Some of the feeds have cottonseed or other nitrogenous feeding stuffs added to them so that they carry more protein than straight oat feeds, but these mixtures are always more expensive sources of protein than are the glutens, cottonseed and linseed meals. One hundred pounds of an ordinary oat feed has from eight to eleven pounds protein. At seventy-five cents per hundred the protein costs from seven to nine cents a pound. One hundred pounds of a good gluten meal has from thirty-four to forty per cent of protein. At $1.10 per hundred the protein costs about three cents a pound and it not only costs less than half as much but it is better digested. As a source of protein, it would be as good economy to pay $60.00 a ton for high grade cottonseed meal as to pay $15.00 a ton for the ordinary oat feed.

MANUFACTURERS AND PLACE OF SAMPLING.

Station Number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8278	American Cotton Oil Co	Huntsville, Ala	Pittsfield
8282	American Cotton Oil Co	Huntsville, Ala	Bowdoinham
8338	American Cotton Oil Co	Huntsville, Ala	East Sumner
8279	American Cotton Oil Co	Pine Bluff, Ark	Pittsfield
8280	American Cotton Oil Co	Little Rock, Ark	Dexter
8283	American Cotton Oil Co	Brinkley, Ark	Newport
8281	American Cotton Oil Co	Memphis, Tenn	Belfast
8284	American Cotton Oil Co	Jackson, Tenn	Belfast
8285	American Cotton Oil Co	Jackson, Tenn	Rockland
8337	American Cotton Oil Co	Jackson, Tenn	Dixfield
8339	American Cotton Oil Co	Nashville, Tenn	East Sumner
8380	American Cotton Oil Co	Nashville, Tenn	Monmouth
8389	American Cotton Oil Co	Nashville, Tenn	Auburn
8349	American Cotton Oil Co	....	Buxton Center
8286	The Southern Cotton Oil Co	Little Rock, Ark	Bath
8289	J. E. Soper & Co	....	Newport
8381	J. E. Soper & Co	....	Augusta
8293	R. B. Brown Oil Co	....	Dexter
8294	R. B. Brown Oil Co	....	Corinna
8295	S. W. Thaxter & Co	Benham, Texas	Bucksport
8296	S. W. Thaxter & Co	Benham, Texas	Orrington
8297	S. W. Thaxter & Co	Benham, Texas	Thomaston
8287	S. W. Thaxter & Co	Benham, Texas	Winterport
8290	F. W. Brodé & Co	Memphis, Tenn	Brunswick
8291	F. W. Brodé & Co	Memphis, Tenn	Dexter
8292	F. W. Brodé & Co	Memphis, Tenn	Foxcroft
8340	F. W. Brodé & Co	Memphis, Tenn	W. Minot
8341	F. W. Brodé & Co	Memphis, Tenn	Canton
8350	F. W. Brodé & Co	Memphis, Tenn	Buxton Center
8364	F. W. Brodé & Co	Memphis, Tenn	Bridgton
8382	F. W. Brodé & Co	Memphis, Tenn	Monmouth
8390	F. W. Brodé & Co	Memphis, Tenn	Lewiston
8402	F. W. Brodé & Co	Memphis, Tenn	Houlton
8288	I. A. Barstow	....	Bangor
8391	C. S. O. Co	....	Farmington
8308	Chas. Pope Glucose Co	Chicago, Ill	Camden
8309	Chas. Pope Glucose Co	Chicago, Ill	Orrington
8310	Chas. Pope Glucose Co	Chicago, Ill	Brunswick
8345	Chas. Pope Glucose Co	Chicago, Ill	South Paris
8353	Chas. Pope Glucose Co	Chicago, Ill	Saco
8367	Chas. Pope Glucose Co	Chicago, Ill	Portland
8395	Chas. Pope Glucose Co	Chicago, Ill	Lewiston
8298	The Glucose Sugar Refining Co.	....	Thomaston
8299	The Glucose Sugar Refining Co.	....	Brunswick
8300	The Glucose Sugar Refining Co.	....	Bucksport
8301	The Glucose Sugar Refining Co.	....	Bangor
8302	The Glucose Sugar Refining Co.	....	Belfast
8303	The Glucose Sugar Refining Co.	....	Winterport

ANALYSES OF SAMPLES.

Name of feed.	Moisture—per cent.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Prime Cotton Seed Meal........	7.55	42.25	43.00	11.48	9.00	8278
Prime Cotton Seed Meal.......	8.57	46.44	43.00	10.23	9.00	8282
Prime Cotton Seed Meal........	8.36	43.94	43.00	9.77	9.00	8338
Prime Cotton Seed Meal........	8.10	45.38	43.00	10.43	9.00	8279
Prime Cotton Seed Meal........	8.30	45.50	43.00	9.43	9.00	8280
Prime Cotton Seed Meal.... ...	6.67	47.13	43.00	12.46	9.00	8283
Prime Cotton Seed Meal........	7.98	42.25	43.00	13.32	9.00	8281
Prime Cotton Seed Meal.......	9.21	47.81	43.00	8.80	9.00	8284
Prime Cotton Seed Meal........	8.90	47.00	43.00	10 78	9.00	8285
Prime Cotton Seed Meal........	9.73	46.94	43.00	10.33	9.00	8337
Prime Cotton Seed Meal.......	8.48	46.69	43.00	10.31	9.00	8339
Prime Cotton Seed Meal........	7.42	46.75	43.00	11.26	9.00	8380
Prime Cotton Seed Meal........	7.71	46.00	43.00	11.47	9.00	8389
Prime Cotton Seed Meal........	8.59	45.82	43.00	10.51	9.00	8349
Prime Cotton Seed Meal.... ...	8.46	46.82	43.00	9.76	9.00	8286
Cotton Seed Meal...............	8.40	46.13	43.00	8.78	9.00	8289
Cotton Seed Meal...........	6.27	44.75	43.00	14.72	9.00	8381
Prime Cotton Seed Meal........	9.32	47.88	43.00	8.34	9.00	8293
Prime Cotton Seed Meal.......	8.20	46.75	43.00	9.97	9.00	8294
Cotton Seed Meal........... ...	8.33	48.69	49.25	11.25	15.62	8295
Cotton Seed Meal....	8.54	50.06	49.25	10.87	15.62	8296
Cotton Seed Meal...	7.70	51.26	49.25	10.33	15.62	8297
Cotton Seed Meal	7.46	51.92	49.25	10.71	15.62	8287
Owl Brand Cotton Seed Meal ..	8.46	44.50	43.00	11.38	9.00	8290
Owl Brand Cotton Seed Meal ..	7.84	44.63	43.00	10.63	9.00	8291
Owl Brand Cotton Seed Meal ..	7.50	45.32	43.00	11.50	9.00	8292
Owl Brand Cotton Seed Meal ..	8.20	46.38	43.00	9.90	9.00	8340
Owl Brand Cotton Seed Meal ..	7.24	43.31	43.00	13.13	9.00	8341
Owl Brand Cotton Seed Meal ..	8.30	43.31	43.00	12.08	9.00	8350
Owl Brand Cotton Seed Meal ..	7.52	45.13	43.00	12.41	9.00	8364
Owl Brand Cotton Seed Meal ..	8.09	44.75	43.00	12.49	9.00	8382
Owl Brand Cotton Seed Meal ..	7.30	44.50	43.00	12.59	9.00	8390
Owl Brand Cotton Seed Meal ..	9.28	45.00	43.00	12.87	9.00	8402
Sea Island Cotton Seed Meal ...	10.73	21.82	20.13	5.83	4.57	8288
Sea Island Cotton Seed Meal ...	10.98	25.06	24.31	7.09	5.00	8391
Cream Gluten Meal	9.79	30.94	37.12	3.38	3.20	8308
Cream Gluten Meal	8.92	33.50	37 12	5.43	3.20	8309
Cream Gluten Meal	9.48	34.88	37.12	2.24	3.20	8310
Cream Gluten Meal	10.04	33.81	37.12	3.49	3.20	8345
Cream Gluten Meal	8.48	35.69	37.12	2.73	3.20	8353
Cream Gluten Meal	9.27	32.56	37.12	4.32	3.20	8367
Cream Gluten Meal	9.35	31.19	37.12	3.13	3.20	8395
Chicago Gluten Meal...........	10.56	37.13	37.50	2.59	9.00	8298
Chicago Gluten Meal...........	11.02	39.63	37.50	1.94	9.00	8299
Chicago Gluten Meal	11.15	36.13	36.00	2.49	3.37	8300
Chicago Gluten Meal.......	10.76	38.82	38.00	2.79	2.00	8301
Chicago Gluten Meal	10.52	38.63	38.00	2.01	2.00	8302
Chicago Gluten Meal...........	10.23	37.69	37.50	2.13	9.00	8303

MANUFACTURERS—CONTINUED.

Station Number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8304	The Glucose Sugar Refin. Co		Foxcroft
8342	The Glucose Sugar Refin. Co		Minot
8351	The Glucose Sugar Refin. Co		Buxton Center
8365	The Glucose Sugar Refin. Co		Bridgton
8375	The Glucose Sugar Refin. Co		Milltown
8376	The Glucose Sugar Refin. Co		Calais
8383	The Glucose Sugar Refin. Co		Waterville
8392	The Glucose Sugar Refin. Co		Lewiston
8305	National Starch Manf'g Co	Indianapolis, Ind.	Foxcroft
8306	National Starch Manf'g Co	Indianapolis, Ind.	Richmond
8343	National Starch Manf'g Co	Indianapolis, Ind.	Canton
8393	National Starch Manf'g Co	Indianapolis, Ind.	Lewiston
8394	National Starch Manf'g Co	Des Moines, Iowa	Farmington
8384	National Starch Manf'g Co	Des Moines, Iowa	Oakland
8344	National Starch Manf'g Co	Des Moines, Iowa	Dixfield
8307	National Starch Manf'g Co	Des Moines, Iowa	Dexter
8352	National Starch Manf'g Co	Des Moines, Iowa	Springvale
8358	National Starch Manf'g Co		North Yarmouth
8366	National Starch Manf'g Co		Gorham
8311	Arthur R. Hopkins	Bangor	Bangor
8312	American Glucose Co		Dexter
8327	S. W. Thaxter & Co		Bath
8346	The Glucose Sugar Refin. Co		West Paris
8354	The Glucose Sugar Refin. Co		Berwick
8377	The Glucose Sugar Refin. Co		Calais
8396	The Glucose Sugar Refin. Co		Auburn
8328	Douglas & Co		Brunswick
8329	The Cleveland Linseed Oil Co		Rockland
8330	The Cleveland Linseed Oil Co		Belfast
8313	The American Cereal Co		Bucksport
8314	The American Cereal Co		Brunswick
8316	The American Cereal Co		Rockland
8317	The American Cereal Co		Foxcroft
8347	The American Cereal Co		West Paris
8357	The American Cereal Co		Waterboro
8369	The American Cereal Co		Fryeburg
8378	The American Cereal Co		Eastport
8385	The American Cereal Co		Showhegan
8397	The American Cereal Co		Auburn
8403	The American Cereal Co		Houlton
8315	S. A. & J. H. True		Brunswick
8318	The American Cereal Co		Newport
8319	The American Cereal Co		Brunswick
8320	The American Cereal Co		Rockland
8321	The American Cereal Co		Foxcroft
8348	The American Cereal Co		West Paris
8356	The American Cereal Co		Waterboro
8368	The American Cereal Co		South Windham

ANALYSES—CONTINUED.

Name of Feed.	Moisture—per cent.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Chicago Gluten Meal	10.47	40.63	37.50	1.70	9.00	8304
Chicago Gluten Meal	11.58	36.88	36.00	1.98	3.37	8342
Chicago Gluten Meal	10.98	37.50	37.50	1.89	9.00	8351
Chicago Gluten Meal	11.28	39.69	38.00	1.92	2.00	8365
Chicago Gluten Meal	11.72	37.07	38.00	2.05	2.00	8375
Chicago Gluten Meal	11.37	36.88	37.50	2.20	9.00	8376
Chicago Gluten Meal	10.50	38.44	37.50	1.80	9.00	8383
Chicago Gluten Meal	10.52	37.50	37.50	2.61	9.00	8392
King Gluten Meal	9.44	34.06	32.00	4.28	16.00	8305
King Gluten Meal	6.69	37.32	32.00	5.06	16.00	8306
King Gluten Meal	9.34	34.69	32.00	4.30	16.00	8343
King Gluten Meal	7.91	35.75	32.00	6.87	16.00	8393
King Gluten Meal	7.04	32.44	32.00	15.57	16.00	8394
King Gluten Meal	6.04	33.13	32.00	15.54	16.00	8384
King Gluten Meal	7.87	31.50	34.26	13.24	14.65	8344
King Gluten Meal	6.34	32.82	32.00	15.41	16.00	8307
King Gluten Meal	8.28	32.81	32.00	16.40	16.00	8352
King Gluten Meal	8.20	33.25	32.00	16.30	16.00	8358
King Gluten Meal	7.07	32.06	32.00	15.90	16.00	8366
Imperial Gluten Meal	9.20	20.13	20.00	12.00	11.50	8311
Buffalo Gluten Feed	9.27	28.25	29.00	4.68	3.00	8312
Gluten Feed	10.26	22.63	*	5.93	*	8327
Rockford Diamond Gluten Feed	10.50	25.44	24.20	4.08	3.75	8346
Rockford Diamond Gluten Feed	9.44	25.44	24.20	3.44	3.75	8354
Rockford Diamond Gluten Feed	8.94	24.69	24.20	3.86	3.75	8377
Rockford Diamond Gluten Feed	7.34	25.75	24.20	4.43	3.75	8396
Old Process Oil Meal	9.00	26.63	36.94	6.45	6.58	8328
Cleveland Flax Meal	11.68	39.75	39.00	2.28	1.50	8329
Linseed Oil Meal	10.40	36.81	39.00	2.52	1.50	8330
Victor Corn and Oat Feed	9.52	9.56	9.46	4.31	3.92	8313
Victor Corn and Oat Feed	9.21	8.12	9.46	3.36	3.92	8314
Victor Corn and Oat Feed	9.31	9.94	9.46	4.44	3.92	8316
Victor Corn and Oat Feed	10.67	8.88	9.46	3.84	3.92	8317
Victor Corn and Oat Feed	10.20	9.06	9.46	3.18	3.92	8347
Victor Corn and Oat Feed	10.57	8.88	9.46	2.85	3.92	8357
Victor Corn and Oat Feed	8.90	9.69	9.46	4.92	3.92	8369
Victor Corn and Oat Feed	9.46	9.38	9.46	4.87	3.92	8378
Victor Corn and Oat Feed	8.54	8.75	9.46	3.53	3.92	8385
Victor Corn and Oat Feed	9.15	8.38	9.46	3.31	3.92	8397
Victor Corn and Oat Feed	11.25	9.02	9.46	3.57	3.92	8403
Corn and Oat Feed	9.80	8.38	9.63	3.44	4.23	8315
Quaker Oat Feed	8.94	9.44	12.03	2.57	3.49	8318
Quaker Oat Feed	8.36	10.31	12.03	3.61	3.49	8319
Quaker Oat Feed	8.32	11.13	12.03	3.57	3.49	8320
Quaker Oat Feed	7.48	7.44	12.03	2.98	3.49	8321
Quaker Oat Feed	8.27	10.31	12.03	3.29	3.49	8348
Quaker Oat Feed	9.51	10.38	12.03	2.87	3.49	8356
Quaker Oat Feed	7.95	10.88	12.03	3.79	3.49	8368

* Not guaranteed.

MANUFACTURERS—CONCLUDED.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8399	The American Cereal Company	....	Lewiston ....
8322	The American Cereal Company	....	Brunswick ....
8323	The American Cereal Company	....	Richmond ....
8373	W. H. Haskell & Company.....	....	Portland ....
8398	Andrew Cullen & Company	....	Auburn ....
8400	....	....	Auburn ....
8324	The H-O Company	Buffalo	Bowdoinham .....
8372	The H-O Company	Buffalo	Freeport ....
8386	The H-O Company	Buffalo	Bangor ....
8325	The H-O Company	Buffalo	Richmond ....
8371	The H-O Company	Buffalo	Freeport...........
8388	The H-O Company	Buffalo	Bangor ....
8326	The H-O Company	Buffalo	Richmond ....
8370	The H-O Company	Buffalo	Freeport...........
8387	The H-O Company	Buffalo	Bangor ....
8331	E. W. Blatchford & Company..	....	Brunswick..........
8332	The Bowker Fertilizer Co	....	Belfast.............
8333	The Bowker Fertilizer Co	....	Brunswick ....
8334	The Bowker Fertilizer Co	....	Camden ....
8355	The Bowker Fertilizer Co	....	Buxton Center.....
8374	The Bowker Fertilizer Co	....	Gorham ....
8335	Bradley Fertilizer Company ...	....	Belfast ....
8336	Bradley Fertilizer Company ...	....	Belfast ....

ANALYSES—CONCLUDED.

Name of Feed.	Moisture—per cent.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Quaker Oat Feed	7.77	10.75	12.03	3.97	3.49	8399
American Poultry Food	9.82	14.19	*	5.91	*	8322
Corn, Oat and Barley Feed	9.42	12.75	11.26	5.39	4.15	8323
Haskell's Oat Feed	9.13	11.31	9.62	7.91	7.66	8373
Crescent Oat Feed	7.42	8.63	*	3.72	*	8398
Monarch Oat Feed	8.78	11.19	10.25	8.79	7.47	8400
The H-O Co.'s Poultry Feed	10.26	17.81	16.80	5.43	7.00	8324
The H-O Co.'s Poultry Feed	9.43	18.00	16.80	5.76	7.00	8372
The H-O Co.'s Poultry Feed	9.50	18.31	16.80	5.92	7.00	8386
The H-O Co.'s Stand. Dairy Feed	8.19	20.38	18.75	5.42	7.25	8325
The H-O Co.'s Stand. Dairy Feed	8.30	20.94	18.75	5.39	7.25	8371
The H-O Co.'s Stand. Dairy Feed	8.52	17.06	18.75	4.24	7.25	8388
The H-O Co.'s Horse Feed	9.80	11.94	12.30	3.81	4.90	8326
The H-O Co.'s Horse Feed	10.91	11.81	12.30	4.51	4.90	8370
The H-O Co.'s Horse Feed	9.06	11.69	12.30	4.75	4.90	8387
Blatchford's Calf Meal	8.36	33.44	*	5.23	*	8331
Bowker's Animal Meal	5.64	41.07	30.00	14.05	5.00	8332
Bowker's Animal Meal	5.67	44.31	30.00	12.05	5.00	8333
Bowker's Animal Meal	6.11	44.94	30.00	12.94	5.00	8334
Bowker's Animal Meal	5.62	41.75	30.00	13.40	5.00	8355
Bowker's Animal Meal	6.04	40.50	30.00	12.32	5.00	8374
Bradley's Superior Meat Meal	6.06	43.56	40.00	15.95	15.00	8335
Old Fashioned Beef Scraps	7.93	49.13	40.00	19.60	10.00	8336

* Not guaranteed.

SUMMARY OF ANALYSES.

	Number of analyses.		PROTEIN. Found—per cent.	PROTEIN. Guaranteed—per cent.	FAT. Found—per cent.	FAT. Guaranteed—per cent.
American Cotton Oil Co.'s		Highest	47.81	....	13.32	
Prime Cotton Seed Meal.	14	Lowest	42.25	43.00	8.80	9.00
		Average	45.71	....	10.75	
Southern Cotton Oil Co.'s Prime Cotton Seed Meal.	1	....	46.82	43.00	9.76	9.00
J. E. Soper & Co.'s		Highest	46.13	....	14.72	
Cotton Seed Meal.	2	Lowest	44.75	43.00	8.78	9.00
		Average	45.44	....	11.75	
R. B. Brown Oil Co.'s		Highest	47.88	....	9.97	
Prime Cotton Seed Meal.	2	Lowest	46.75	43.00	8.34	9.00
		Average	47.32	....	9.16	
S.W. Thaxter & Co.'s		Highest	51.92	....	11.25	
Cotton Seed Meal.	4	Lowest	48.69	49.25	10.33	15.62
		Average	50.48	....	10.79	
F. W. Brodé & Co.'s		Highest	46.38	....	13.13	
Owl Brand Cotton Seed Meal.	10	Lowest	43.31	43.00	9.90	9.00
		Average	44.68	....	11.90	
Sea Island Cotton Seed Meal.	2	Highest	25.06	....	7.09	
		Lowest	21.82	*	5.83	*
		Average	23.44	. ...	6.46	
Charles Pope Glucose Co.'s		Highest	35.69	....	5.43	
Cream Gluten Meal.	7	Lowest	30.94	37.12	2.24	3.20
		Average	33.22	....	3.53	
The Glucose Sugar Refin'g Co.'s.		Highest	40.63	38.00	2.79	3.37
Chicago Gluten Meal.	14	Lowest	36.13	36.00	1.70	2.00
		Average	38.01	....	2.15	
National Starch M'f'g Co.'s		Highest	37.32	....	16.40	
King Gluten Meal.	11	Lowest	31.50	32.00	4.28	16.00
		Average	33.62	....	11.72	
Arthur R. Hopkins's Imperial Gluten Meal.	1	....	20.13	20.00	12.00	11.50
American Glucose Co.'s Buffalo Gluten Feed.	1	....	28.25	29.00	4.68	3.00
S. W. Thaxter & Co.'s Gluten Feed.	1	.. ..	22.63	....	5.93	......
The Glucose Sugar Refin'g Co.'s		Highest	25.75	....	4.43	
Rockford Diamond Glut.Feed.	4	Lowest	24.69	24.20	3.44	3.75
		Average	25.33	....	3.95	
Douglas & Co.'s. Old Process Oil Meal.	1	....	26.63	36.94	6.45	6.58
Cleveland Linseed Oil Co.'s Cleveland Flax Meal.	1	....	39.75	39.00	2.28	1.50
Cleveland Linseed Oil Co.'s Linseed Oil Meal.	1	.. ..	36.81	39.00	2.52	1.50

* For guarantees see page 11.

SUMMARY OF ANALYSES—CONCLUDED.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
The American Cereal Co.'s Victor Corn and Oat Feed.	11	Highest Lowest Average	9.94 8.12 9.06	.... 9.46	4.92 2.85 3.83	3.92
S. A. & J. H. True Co.'s Corn and Oat Feed.	1	... .	8.38	9.63	3.44	4.23
The American Cereal Co.'s Quaker Oat Feed.	9	Highest Lowest Average	11.13 7.44 8.96	.... 12.03	3.97 2.57 2.96	3.49
The American Cereal Co.'s American Poultry Food.	1	....	14.19	... .	5.91	.....
The American Cereal Co.'s Corn, Oat and Barley Feed.	1	....	12.75	11.26	5.39	4.15
W. H. Haskell & Co.'s Haskell's Oat Feed.	1	....	11.31	9.62	7.91	7.66
Andrew Cullen & Co.'s Crescent Oat Feed.	1	....	8.63	....	3.72	......
Monarch Oat Feed.	1	....	11.19	10.25	8.79	7.47
The H-O Co.'s Poultry Feed.	3	Highest Lowest Average	18.31 17.81 18.04	... . 16.80	5.92 5.43 5.70	7.00
The H-O Co.'s Standard Dairy Feed.	3	Highest Lowest Average	20.94 17.06 19.46	.... 18.75	5.42 4.24 5.02	7.25
The H-O Co.'s Horse Feed.	3	Highest Lowest Average	11.94 11.69 11.81	... . 12.30	4.75 3.81 4.36	4.90
E. W. Blatchford's Calf Meal.	1	....	33.44	... .	5.23	.....
Bowker Fertilizer Co.'s Bowker's Animal Meal.	5	Highest Lowest Average	44.94 40.50 42.51	.... 30.00	14.05 12.05 12.95	5.00
Bradley Fertilizer Co.'s Superior Meat Meal.	1	... .	43.56	40.00	15.95	15.00
Bradley Fertilizer Co.'s Old Fashioned Beef Scraps.	1	....	49.13	40.00	19.60	10.00

J. M. Bartlett, *Chemist.*

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A. J. Patten, } *Chemists.*

COTTON SEED MEAL.

Pure cotton seed meal is made by grinding the seed after the white down, which remains upon the seed as it comes from the gotton gin, and the hard hulls have been removed. Decorticated cotton seed meal thus prepared carries from forty to fifty-three per cent of protein. From the ease with which hulls may be ground with the cotton seed, this class of goods offers peculiar opportunity to dishonest manufacturers and dealers. When the feeding stuff law went into effect in the fall of 1897 the State was filled with inferior goods carrying from twenty-two to thirty per cent of protein. In the spring of 1898 the inspectors reported a few lots of these goods. In November, 1898, only two lots of low grade cotton seed meal were found by the inspectors, and these samples were guaranteed in accordance with their low grade. Occasionally the Station has had sent to it by correspondents samples of suspected meal, but analyses have shown them to be up to guarantee.* Not all dark colored meal is adulterated and not all bright yellow meal is free from adulteration. The following statement made in bulletin 44 apparently represents the status of low grade cotton seed meal at present: "Goods of this type were very abundant in this State in 1897 but there are almost none of them to be found at present. The inspection law has driven them to other states."

As will be seen from the analyses the cotton seed meals agree quite closely with the guaranteed analyses.

GLUTEN MEALS AND FEEDS.

Gluten meals and gluten feeds are by-products left in the manufacture of starch and glucose from Indian corn. Corn consists largely of starch. The waste product from the manufacture of starch or sugar is relatively much richer in oil and protein than corn. Many factories are removing part of the corn oil from the waste, so that some gluten meals carry but little oil. This reduction in fat is an advantage, as feeding corn oil to dairy animals seems to have a tendency to make the butter soft. No by-products used for feeding differ more from each other than do these starch and sugar wastes. All manufacturers

* After this Bulletin was in press one low grade *unguaranteed* sample has been received.

apparently do not recognize that the composition of these offals change greatly, and some of them have based their guarantees upon old analyses.

Cream gluten meal is not up to the guarantee in protein. It is guaranteed to carry thirty-seven per cent, but from the samples drawn the purchaser can not expect more than thirty-three per cent of protein on the average, and one sample ran as low as thirty-one per cent of protein. The attention of the handlers of this feed has been called to these discrepancies between guarantee and analysis and they will probably be corrected on future shipments.

Fourteen samples of Chicago gluten meal were collected by the inspectors. These samples represent both old and new goods. The old goods were guaranteed too high in fat. The present guarantee, thirty-eight per cent protein and two per cent fat, fairly well represents the goods on the market. The protein found in the samples examined, agrees as closely as can be expected with the guarantees. The State agents seem to be anxious that their guarantees shall represent the goods as sold.

King gluten meal as sold in Maine comes from two mills, the output of which differs greatly in composition. The goods made at the Des Moines mill are very close with the guarantee, thirty-two per cent protein and sixteen per cent fat; the goods from the Indianapolis mills are higher in protein than the guarantee and are correspondingly low in fat. The Indianapolis goods carry about thirty-four per cent protein and four per cent of fat. The attention of the dealers has been called to this and the goods will by correctly branded in the near future.

GLUTEN FEEDS.

But little gluten feed is offered in the State. That found agreed in composition with the guarantee. At Bath a small amount of gluten feed was found which did not carry any guarantee.

LINSEED MEAL.

Only three samples of linseed meal were found by the inspectors. Its high cost, relative to cottonseed meal, has apparently crowded it out of the market. The guarantee of Douglass & Company's oil meal was based upon an analysis of a sample sent to the Station months before by the wholesaler, who writes as follows: "When you analyzed our oil meal we had a large quantity on hand, and we tagged as you directed. It is so high now that very little is sold and we have had a few lots that we have sold and we supposed was of same quality. We have not at present a single sack in our store."

OAT FEEDS.

A number of samples of different oat feeds have been examined. For the most part guarantees are based upon single analyses of the feeds and the goods usually are not quite as good as the sample upon which the guarantee rests. With the exception of the American Cereal Company's Quaker Oat Feed none of these materials are much below and some run above the guarantee.

BLATCHFORD'S CALF MEAL.

This is a manufactured food only one lot of which was found by our inspectors. This was not guaranteed but carried 33.44% protein and 5.23% of fat. In some advertising matter connected with Blatchford's calf meal it is claimed that 12.8 pounds of it has three and one-half pounds of protein, which is about twenty-seven and one-half per cent. A sample of these goods sent by a dealer to the Station in September analyzed as follows:

Water, 7.70%; ash, 5.46%; protein, 25.63%; crude fiber, 5.28%; starch, 18.24%; undetermined carbohydrates, 32.13%; fat, 5.56%. It will be observed that the goods as evidenced by the official sample and this lot sent to the Station are very uneven in composition;—one sample carrying about 26% and the other about 33% of protein. A large part of the ash is common salt.

These goods were sent to an expert on food mixtures and adulterations at the Connecticut Experiment Station who reports as follows: "I have examined Blatchford's calf meal under the microscope and find it contains linseed meal, some product from the wheat kernel, some product from the bean kernel and a little fenugreek. The linseed meal appears to be the chief constituent. The wheat product is bran, middlings or some similar product consisting of starchy matter mixed with more or less of the seed coats. Bean bran was present in considerable amount and more or less of the starchy matter."

In a letter just at hand from Mr. J. W. Barwell, the proprietor of these goods, he says: "Regarding the ingredients, I cannot give you the exact constituents of it, but I may say that it is composed mostly of locust bean meal with leguminous seeds such as lentils, etc., and oleaginous seeds such as flax-seed, fenugreek and annis seed, all cleaned, hulled and ground together and thoroughly well cooked. There is no cheap mill food and no low grade feed enters into this composition. I am prepared to go into any court in the United States and make an affidavit that there is no farmer in the United States that can compound Blatchford's calf meal for less than $3.50 per hundred."

Locust bean meal which Mr. Barwell claims to be the chief constituent of Blatchford's calf meal is practically not used in this country as a cattle feed. The average of ten English and German analyses show it to carry:—water, 14.96%; ash, 2.53%; protein, 5.86%; crude fiber, 6.39%; nitrogen-free extract, 68.98%; fat, 1.28%.

It is evident from the chemical analysis that locust bean meal cannot be the chief constituent of Blatchford's calf meal, but that the microscopist is correct that linseed meal is the chief constituent. Locust bean meal has only six per cent of protein and in order to make a mixture carrying from twenty-six to thirty-three per cent of protein, it would be necessary to add large quantities of goods like linseed meal rich in protein. As seen from the analysis Blatchford's calf meal has a feeding value somewhat inferior to old process linseed meal. Whatever it may cost to manufacture, no man who has sufficient intelligence to mix feeds can afford to buy it at anything like the price asked.

CHIEF REQUIREMENTS OF THE LAW.

The points of the law of most interest both to the dealer and consumer are concisely stated below.

Kinds of Feed coming within the Law. The law applies to all feeding stuffs *except* hays and straws; whole seeds and meals of wheat, rye, barley, oats, Indian corn, buckwheat and broom corn; brans and middlings. The principal feeds coming under the provisions of the law are linseed meals, cottonseed meals, pea meals, cocoanut meals, gluten meals, gluten feeds, maize feeds, starch feeds, sugar feeds, dried brewer's grains, malt sprouts, hominy feeds, cerealine feeds, rice meals, oat feeds, corn and oat chops, ground beef or fish scraps, mixed feeds, and all other materials of similar nature.

Inspection Tax and Tag. To meet the expenses of inspection, a tax of ten cents per ton must be paid to the Director of the Maine Agricultural Experiment Station. On receipt of the inspection tax, the Director of the Station is required to furnish a tag stating that all charges have been paid. This tag must be affixed to the package before it is offered for sale.

The Brand. Each package of feeding stuff included within the law shall have affixed the inspection tax tag and shall also bear, conspicuously printed, the following statements:

The number of net pounds contained in the package.

The name or trade mark under which it is sold.

The name of the manufacturer or shipper.

The place of manufacture.

The place of business of manufacturer or shipper.

The percentage of crude protein.

The percentage of crude fat.

These statements may be printed directly on the bag, on a tag attached to the package, or on the back of the inspection tax tag furnished by the Director of the Station.

A copy of the statement of brand must be filed with the Director of the Station. The goods must carry the inspection tax tag and the brand before they can be legally offered for sale in the State. It will not answer to affix tags at the time the goods are sold.

FREE ANALYSIS OF FEEDING STUFFS.

The Station officers take pains to obtain for analysis samples of all feeding stuffs coming under the law, but the co-operation of consumers is essential for the full and timely protection of their interests. Whenever any one believes that the law is being evaded in any way, he is requested to notify the Director of the Station.

The Station will promptly analyze, free of charge, samples of feeding stuffs *taken in accordance with directions furnished by the Station,* and report the results to the interested parties. Blanks containing full directions for drawing and forwarding samples will be sent on application.

CHAS. D. WOODS, *Director.*

CARE OF ORCHARDS.

W. M. Munson.

The fact that the apple is spontaneous in many parts of the State, and that orchards will exist and bear a partial crop of fruit though utterly neglected, is responsible for much of the ill-treatment seen on every hand. There is little doubt, however, that a well managed orchard is a most valuable farm property, and one of the surest sources of income. In view of the large number of orchards needing care, throughout the State, attention will, at this time, be given to this point rather than to planting.

RENOVATION.

Repair is not necessarily associated with old age and decay. Apple trees ten or fifteen years old sometimes need repairing quite as much as do old and neglected ones. When the orchard to be treated has been neglected for many years, the first operation, if the land does not need draining, is to prune thoroughly. In this operation, which may be performed at any time from late fall till the middle of May, care should be used that the trees are given an open head. This does not imply that all small side limbs should be removed, leaving a lot of whipstocks, but that such of the larger limbs as are parallel and close together, or those which cross, should be cut out. Half of the difficulty of pruning is done away with if one decides to allow the tree its natural form, rather than to attempt to shape it to some particular model.

Many growers suppose that pruning weakens the tree and shortens its life. There is, however, no reason for this belief, other than the general statement that "pruning is unnatural." But pruning is not unnatural. Man seldom prunes so heavily as does nature in removing superfluous limbs in the growth of young saplings in the forest. Furthermore, nature prunes at all seasons and in the rudest ways. By this it should not be understood, however, that care is not necessary in the mechanical operation of pruning. On the other hand, it is of the greatest importance that large limbs be removed with care and the wounds painted to prevent the entrance of fungi which will induce decay.

Trees are sometimes broken by heavy loads of fruit or by ice. In such matters, prevention is better than cure, and in training young trees, all crotches should be avoided. If bad crotches should be found to exist in trees ten or more years old, they should be braced by means of an iron bolt. Much damage may be avoided if bolts are used in season.

If the land on which the orchard is located has never been plowed, the surest way of stirring the soil and working in the necessary fertilizer is to fence off a portion of the area to be renovated, and turn in several hogs. The hogs, in rooting for grubs, will stir the soil as completely as would be possible with plow and harrow. The value of this treatment has been fully demonstrated at the farm of Charles S. Pope, Manchester, where most of the orchard work of this Station has been conducted. An orchard some fifty years old, which had not been plowed for more than twenty years, was treated as above noted, ten hogs being placed in the enclosure of about one and one-half acres in extent. The trees in this enclosure assumed a brighter, richer color which was noticeable from the street, half a mile distant. No accurate account of the yield of the trees in this plot as compared with others was kept, but Mr. Pope reports that there was a decided difference both in yield and in quality of the fruit. So satisfactory were the results that each year since the first trial a new area is set apart for similar treatment.

Not infrequently, during winters when the snow remains long on the ground, apple trees will be girdled by mice and rabbits. In such a case, "bridge grafting" is often practiced with satisfactory results; *i. e.* cions are set at frequent intervals about the trunk of the tree, one end being inserted underneath the bark above the wound, the other below. In this way the circulation of sap is maintained and the tree may be saved. The wound should be covered with grafting wax or with fresh cow dung, to exclude the air.

GRAFTING.

In starting a new orchard it is usually advisable to set trees which have been grafted in the nursery, rather than to set chance seedlings with the expectation of top-grafting them. Some varieties, as the Baldwin, do better when "top-worked," but even for such, nursery grown stock of Ben Davis, Northern Spy, Pewaukee or some other hardy, vigorous sort will give more uniform and satisfactory results than will seedlings.

While, in general, it is well to avoid top-grafting, there are few orchards in which some such work is not necessary, and many worthless seedlings, along the roadside and in the pastures, may be converted into valuable sources of income. The most successful grafting is that which disturbs the tree least. The first rule to observe, in grafting large trees is: "Graft many and small limbs." Before commencing to graft, decide carefully at what distance from the body, or from the center of the top, the main limbs should be cut to insure a good top. If a spread of six feet or ten feet from the center is decided upon, graft all of the main branches at that distance. In other words, one must plan for the future top of the tree; simply making the cions grow, being but a part of the operation. If the tree has been properly pruned, most of the more conspicuous branches should be grafted, and to avoid long pole-like limbs some cions should be set on the side branches of all the larger limbs. The practice of grafting a few large stubs low down, is not to be commended; the shock of removing a large portion of the top at one time is a serious one, and there is often injury from sun-scald. A good grafter will leave enough small brush in the center of the tree to screen the trunk and larger branches.

Old neglected trees which are to be worked over, may with profit be given a preparatory pruning a year or two before grafting. Unnecessary limbs can be cut out better before grafting than afterwards. The ungrafted limbs must be gradually removed; the removal being made annually to about the extent of the growth of the cions, or a little more.

FERTILIZING.

The profit in fruit growing lies in securing an extra large amount of fruit of superior quality. This end can only be attained by the addition of a supply of plant-food in excess of that demanded for the growth of the trees. How much plant-food should be added is simply a matter of business that must be settled by each individual for his own farm. The actual fertility of the soil depends upon the plant as well as upon the amount and kind of plant-food in the soil; for only when the plant is in a healthy, vigorous condition can the maximum

amount of food be appropriated. In most cases, as much depends upon the physical condition of the soil, as upon its chemical constitution.

In general, a liberal application of ground bone or phosphatic rock and of hardwood ashes will be found the most satisfactory fertilizing material for orchards. Stable manure may also be used with good effect, on soils deficient in organic matter; though for most orchards potash and phosphoric acid are desired, rather than nitrogen.

CULTURE.

Many good orchards are so located that cultivation is out of the question. There is no doubt, however, that where possible, thorough culture, especially while the orchard is young, is much to be desired. By cultivation, the soil is rendered in better condition for the feeding roots, the plant food is thus rendered more available, and the moisture is better conserved than in any other way. During the first years after planting, hoed crops may be grown between the trees, provided sufficient fertilizers are used. In no case, however, should a grain crop be grown, except as a cover crop to be plowed under in the spring. The accompanying illustrations clearly represent the value of culture. The cut on the opposite page represents an orchard of Fameuse,

Northern Spy and Milding planted, as two-year-old trees, in 1892. The above illustration shows an orchard of similar varieties planted the next year. The first has been given thorough culture and was severely pruned in 1897; the other, separated from the first only by a fence, has been left without treatment, and a crop of hay has been taken off each year. Further remark is unnecessary.

SPRAYING.

Spraying is an easy and practical way of applying insecticides and fungicides. Insecticides act in two ways: (1) By poisoning the insects, when eaten; (2) by closing the breathing pores of the insects, or acting as an external irritant. Paris green is an example of the first class; kerosene emulsion or pyrethrum of the second. Hellebore, if applied in the dry form, acts in both ways. By spraying the trees with Paris green, some particles of the poison will be lodged upon the young fruit or upon the leaves; then as the insects attempt to enter the fruit, or to eat the foliage, they are destroyed.

Fungicides are of importance solely as preventives. The coating of Bordeaux mixture, or other material, upon the fruit and leaves, kills the germinating spores of the fungi before they penetrate the plant tissue. The time of spraying will naturally vary, depending on the purpose in view and the material used. The subject has been discussed in Bulletin 29.

ORCHARD WORK NOW IN PROGRESS AT THE EXPERIMENT STATION.

The principal orchard work now in progress at the Experiment Station is along the lines of tillage and fertilizers. At the farm of Charles S. Pope, Manchester, a young orchard, set on land which has never been plowed, has been laid off in plats, part of which are treated with concentrated fertilizers, and part with stable manure. Half of the orchard has been placed under cultivation, and the other half is heavily mulched.

Another orchard, on the same farm, has been divided into plats for treatment with different salts of potash, with a view to studying the effect, if any, upon quality of fruit and susceptibility to attack of apple scab.

In Aroostook County, as noted in previous reports, some of the more promising Russian varieties of apples, plums, and cherries are under trial; also some of the hardier American sorts. Such of these as have fruited were discussed in the Annual Report of this Station for 1896.

At present there are growing in the Station nurseries several hundred of the hardier standard apples which will next year be sent to different parts of the State, where encouragement to the fruit growing industry seems necessary. These varieties include Arctic, Shiawassee Beauty, Sutton Beauty, Westfield, etc.

INSPECTION OF FERTILIZERS, 1899.

This bulletin contains the analyses of manufacturers' samples of brands of fertilizers licensed before March 8, 1899.

The analyses which appear here are those made from manufacturer's samples, which are deposited under affidavit that they are reasonably near in composition to the corresponding brands found in the market.

The figures which are given as the percentages of valuable ingredients guaranteed by the manufacturers are the minimum percentages of the guarantee. If, for instance, the guarantee is 2 to 3 per cent. of nitrogen, it is evident that the dealer can not be held to have agreed to furnish more than 2 per cent., and so this percentage is taken as the actual guarantee. The figures under the head of "found" are those showing the actual composition of the samples deposited.

DESCRIPTIVE LIST OF MANUFACTURERS' SAMPLES, 1899.

Station number.	Manufacturer, place of business and brand.
	HIRAM BLANCHARD, EASTPORT, ME.
2114	Blanchard's Fish, Bone and Potash
2115	Blanchard's Ground Fish Scrap, No. 2
	BOWKER FERTILIZER CO., BOSTON, MASS.
1252	Bowker's Ammoniated Dissolved Bone
1868	Bowker's Bone and Wood Ash Fertilizer
1852	Bowker's Corn Phosphate
1251	Bowker's Farm and Garden Phosphate
1257	Bowker's Fresh Ground Bone
1579	Bowker's High Grade Fertilizer
1248	Bowker's Hill and Drill Phosphate
1872	Bowker's Market Garden Manure
1389	Bowker's Potato and Vegetable Phosphate
1390	Bowker's 6 % Potato Fertilizer
1249	Bowker's Special Fertilizers, Potatoes and Vegetables
1250	Bowker's Square Brand Bone and Potash
1866	Bowker's Staple Phosphate or 3 % Fertilizer
1867	Bowker's Superphosphate with Potash
1247	Bowker's Sure Crop Phosphate
1588	Bowker's 10 % Manure
1871	Gloucester Fish and Potash
1580	Stockbridge Corn and Grain Manure
1870	Stockbridge Pea and Bean Manure
1388	Stockbridge Potato and Vegetable Manure
1391	Stockbridge Seeding Down Manure
1869	Stockbridge Strawberry Manure
1392	Stockbridge Top Dressing Manure
	BRADLEY FERTILIZER CO., BOSTON, MASS.
2113	Bradley's Alkaline Bone with Potash
2112	Bradley's Complete Manure for Potatoes and Vegetables
1282	Bradley's Corn Phosphate
2111	Bradley's Eureka Fertilizer
1882	Bradley's Niagara Phosphate
1269	Bradley's Potato Fertilizer
1267	Bradley' Potato Manure
1265	Bradley's X. L. Phosphate
	CLARK'S COVE FERTILIZER CO., BOSTON, MASS.
1600	Bay State Defiance Phosphate
1217	Bay State Fertilizer
1219	Bay State Fertilizer for Seeding Down
1218	Bay State Fertilizer G. G
1215	King Philip Alkaline Guano for Potatoes
	THE CLEVELAND DRYER CO., BOSTON, MASS.
1607	Cleveland Fertilizer for All Crops
1608	Cleveland Pioneer Fertilizer
1264	Cleveland Potato Phosphate
2109	Cleveland Seeding Down Fertilizer
1263	Cleveland Superphosphate
	E. FRANK COE CO., NEW YORK, N. Y.
1901	E. Frank Coe's Bay State Phosphate
2117	E. Frank Coe's Columbian Special Corn Fertilizer
2118	E. Frank Coe's Columbian Special Potato Fertilizer

ANALYSES OF MANUFACTURERS' SAMPLES, 1899.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	As ammonia or nitrates.	As organic.	Total. Found.	Total. Guaranteed.	Soluble.	Reverted.	Insoluble.	Available. Found.	Available. Guaranteed.	Total. Found.	Total. Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
2114	.51	2.44	2.95	2.50	......	2.61	1.28	2.61	2.0	3.89	4.5	3.82	4.5
2115	.49	3.64	4.13	4.47	......	3.39	.89	3.39	3.5	4.43	4.5	1.44	1.0
1252	.....	.....	1.88	1.50	5.32	2.51	2.05	7.83	8.0	9.88	10.0	2.17	2.0
1868	.....	......	1.99	1.50	....	......	2.00	8.86	6.0	10.86	8.0	3.09	2.0
1852	......	......	1.88	1.60	......	....	2.77	8.59	7.0	11.36	9.0	2.26	2.0
1251	.....	.....	1.86	1.50	5.27	3.01	7.79	8.28	8.0	10.07	10.0	2.21	2.0
1257	.....	.....	3.10	2.25	......	.....	....	......	......	17.49	18.0	.....	.....
1579	......	......	2.76	2.25	7.71	2.37	1.92	10.08	8.0	12.00	10.0	4.68	4.0
1248	......	.....	2.60	2.25	7.36	1.87	3.08	9.23	9.0	12.31	12.0	2.52	2.0
1872	.....	......	2.18	2.25	......	.....	2.33	7.80	6.0	10.13	8.0	10.95	10.0
1389	......	......	1.77	1.50	3.83	3.50	5.40	7.33	8.0	12.73	10.0	2.34	2.0
1390	......	......	1.01	.75	3.93	3.88	3.86	7.81	7.0	11.67	10.0	6.38	6.0
1249	.....	....	2.54	2.25	3.79	2.54	4.31	6.33	8.0	10.64	10.0	4.42	4.0
1250	......	.....	1.70	1.50	......	6.40	7.19	6.40	6.0	13.59	12.0	2.21	2.0
1866	......	......	1.06	.75	......	....	3.18	8.68	8.0	11.86	10.0	3.65	3.0
1867	.....	.....	......	......	......	.....	2.82	10.70	10.0	13.52	11.0	3.19	2.0
1247	.....	......	1.02	.75	4.09	3.75	4.07	7.84	8.0	11.91	10.0	1.16	1.0
1588	......	......	1.15	.75	1.30	5.17	3.61	6.47	6.0	10.08	8.0	10.98	10.0
1871	......	......	.97	.75	.....	......	4.86	6.58	6.0	11.44	9.0	1.76	1.0
1580	......	......	3.33	3.00	6.78	1.85	1.91	8.63	8.0	10.54	10.0	6.55	6.0
1870	......	......	2.51	2.00	.....	......	3.21	6.89	6.0	10.10	8.0	6.28	6.0
1388	......	......	3.43	3.25	3.12	2.11	4.26	5.25	6.0	9.49	7.0	9.76	10.0
1391	....	.....	2.62	2.50	5.63	1.76	4.70	7.39	6.0	12.09	12.0	10.27	10.0
1869	.....	......	2.29	2.25	.....	......	3.30	6.96	6.0	10.26	7.0	4.79	4.0
1392	......	......	5.09	5.00	3.52	2.26	3.70	5.78	4.0	9.48	6.0	5.87	6.0
2113	.....	....	2.61	......	6.73	4.25	2.18	10.98	11.0	13.16	12.0	3.71	2.4
2112	1.06	2.40	3.46	3.30	5.36	3.32	1.51	8.68	8.0	10.19	9.0	6.91	7.0
1282	.....	......	2.59	2.05	6.79	3.18	1.42	9.97	9.0	11.39	10.0	1.68	1.5
2111	.11	1.06	1.17	1.03	5.93	2.35	1.55	8.28	8.0	9.83	9.0	2.32	2.0
1882	.....	......	1.00	.82	......	.....	1.10	8.56	7.0	9.66	8.0	1.56	1.1
1269	.....	......	2.11	2.06	8.39	2.28	.93	10.67	9.0	11.60	11.0	3.07	3.2
1267	......	......	2.61	2.50	5.17	2.14	2.23	7.31	6.0	9.54	8.0	5.43	5.0
1265	......	.....	2.70	2.50	7.55	3.58	1.48	11.13	9.0	12.61	11.0	2.27	2.0
1600	......	.....	1.43	.82	7.46	1.72	1.61	9.18	7.0	10.79	9.0	2.10	1.0
1217	......	.....	2.72	2.47	8.10	1.57	.96	9.67	9.0	10.63	10.0	2.65	2.0
1219	.....	....	2.33	1.03	7.18	2.55	1.89	9.73	8.0	11.62	10.0	2.59	2.0
1218	......	......	2.36	1.85	7.38	2.34	1.81	9.72	8.5	11.53	10.0	2.62	2.0
1215	....	......	1.79	1.23	6.52	1.74	1.05	8.26	6.5	9.31	8.0	3.66	3.0
1607	......	......	1.48	1.03	6.71	2.16	2.35	8.87	8.0	11.22	9.0	2.42	2.0
1608	......	......	1.63	.82	6.80	2.39	1.83	9.19	7.0	11.02	9.0	2.00	1.0
1264	.....	......	2.16	2.05	8.83	1.64	.97	10.47	8.0	11.44	10.0	3.21	3.0
2109	.11	1.06	1.17	1.03	5.79	2.89	1.27	8.68	8.0	9.95	9.0	2.20	2.0
1263	......	......	2.39	2.05	7.38	2.51	1.92	9.89	9.0	11.81	11.0	2.71	2.0
1901	.30	1.49	1.79	2.00	6.99	2.77	2.66	9.76	9.0	12.42	11.0	1.89	1.8
2117	.28	1.22	1.50	1.23	5.97	2.86	2.67	8.83	8.5	11.50	10.5	2.94	2 5
2118	.25	1.19	1.44	1.20	5.85	2.97	2.60	8.82	8.5	11.42	10.0	2.75	2.5

DESCRIPTIVE LIST OF MANUFACTURERS' SAMPLES, 1899.

Station number.	Manufacturer, place of business and brand.
2119	E. Frank Coe's Excelsior Potato Fertilizer
1617	E. Frank Coe's Grass and Grain Fertilizer
2116	E. Frank Coe's High Grade Ammoniated Bone Phosphate
1884	E. Frank Coe's High Grade Potato Fertilizer
2120	E. Frank Coe's Prize Brand Grain and Grass Fertilizer
1405	E. Frank Coe's Special Potato Fertilizer
2121	E. Frank Coe's Standard Grade Ammoniated Bone Phosphate
	CROCKER FERTILIZER AND CHEMICAL CO., BUFFALO, N. Y.
1855	Crocker's Ammoniated Corn Phosphate
1853	Crocker's New Rival Ammoniated Superphosphate
1856	Crocker's Potato, Hop and Tobacco Phosphate
1854	Crocker's Superior Fertilizer
	Crocker's Superior Rye and Oats Fertilizer
	CUMBERLAND BONE PHOSPHATE CO., PORTLAND, ME.
1899	Cumberland Bone and Potash
1601	Cumberland Hawkeye Fertilizer
1394	Cumberland Potato Fertilizer
1395	Cumberland Seeding Down Manure
1393	Cumberland Superphosphate
	L. B. DARLING FERTILIZER CO., PAWTUCKET, R. I.
2131	Darling's Animal Anchor Brand
2130	Darling's Animal Fertilizer "G" Brand
2129	Darling's Blood, Bone and Potash
	FRANK S. FARRAR & CO., BANGOR, ME.
1277	Farrar's Potato Manure
1276	Farrar's Superphosphate
	GREAT EASTERN FERTILIZER CO., RUTLAND, VT.
1578	Great Eastern Dissolved Bone
1230	Great Eastern General Fertilizer
1231	Great Eastern Grass and Oats Fertilizer
1233	Great Eastern Northern Corn Special
1232	Great Eastern Potato Manure
	E. L. LEWIS, ATLANTIC, MASS.
2132	Lewis Potato Fertilizer
	LISTER'S AGRICULTURAL CHEMICAL WORKS, NEWARK, N. J.
2105	Lister's Seeding Down Fertilizer
2104	Lister's Special Potato Fertilizer
2103	Lister's Success Fertilizer
2102	Lister's "U. S." Superphosphate
	LOWELL FERTILIZER CO., BOSTON, MASS.
1874	Swift's Lowell Animal Fertilizer
1875	Swift's Lowell Bone Fertilizer
1876	Swift's Lowell Dissolved Bone and Potash
1873	Swift's Lowell Ground Bone
1879	Swift's Lowell Fruit and Vine Fertilizer
1877	Swift's Lowell Potato Phosphate
	NATIONAL FERTILIZER CO., BRIDGEPORT, CONN.
1885	Chittenden's Ammoniated Bone Fertilizer
1886	Chittenden's Complete Root Fertilizer
1887	Chittenden's Market Garden Fertilizer
	SAMUEL G. OTIS, HALLOWELL, ME.
1597	Otis Potato Fertilizer
1880	Otis Seeding Down Fertilizer
1620	Otis Superphosphate
	PACIFIC GUANO CO., BOSTON, MASS.
1605	Pacific Guano Company's Grass and Grain Fertilizer
1604	Pacific Guano Company's Potato Special
1234	Nobsque Guano
1235	Soluble Pacific Guano

ANALYSES OF MANUFACTURERS' SAMPLES, 1899.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	As ammonia or nitrates.	As organic.	Total. Found.	Total. Guaranteed.	Soluble.	Reverted.	Insoluble.	Available. Found.	Available. Guaranteed.	Total. Found.	Total. Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
2119	.65	2.02	2.67	2.50	6.14	1.34	1.27	7.48	8.0	8.75	9.0	9.91	8.0
1617	......	......	2.83	.80	7.88	2.96	3.63	10.84	8.5	14.47	10.0	1.21	1.5
2116	......	....	1.68	1.85	5.97	2.62	2.50	8.95	9.0	11.45	11.0	2.90	2.2
1884	......	......	2.50	2.40		......	1.29	7.71	7.0	9.00	8.0	7.86	6.5
2120	......	......	....	......	12.30	2.57	.47	14.87	10.5	15.34	12.0	.67	2.0
1405	......	.. .	1.95	1.65	7.43	1.82	4.20	9.25	8.0	13.45	10.0	4.58	4.0
2121	.27	1.26	1.53	1.20	6.32	2.33	2.87	8.65	8.5	11.52	10.0	2.45	2.2
1855	......	......	2.92	2.05	......	......	.58	12.21	10.0	12.79	11.0	2.43	1.6
1853	......	......	2.16	1.23	.....	......	.62	11.75	10.0	12.37	11.0	3.37	1.6
1856	......	......	2.42	2.05	......	......	.77	10.68	10.0	11.45	11.0	3.39	3.2
1854	......	......	.90	.82	.....	......	.83	8.86	8.0	9.69	9.0	2.06	2.0
....	......	......	.90	.82	......	......	.83	8.86	8.0	9.69	9.0	2.06	2.0
1899	......	... ..	.....	......	6.38	3.36	2.08	9.74	8.0	11.82	10.0	3.15	2.5
1601	......	.....	1.70	.82	7.45	1.42	1.90	8.87	7.0	10.77	9.0	2.08	1.0
1394	......	......	2.12	2.06	7.01	1.88	2.16	8.89	9.0	11.05	11.0	3.97	3.0
1395	......	......	1.10	1.03	5.82	1.98	2.11	7.80	8.0	9.91	10.0	2.93	2.0
1393	......	.....	2.08	2.06	5.96	3.36	1.92	9.30	8.0	11.22	10.0	3.56	2.0
2131	.23	2.32	2.55	1.65	5.73	2.69	.71	8.42	6.0	9.13	7.0	3.16	2.0
2130	.23	2.32	2.55	2.06	5.60	2.58	.62	8.18	6.0	8.80	7.0	4.64	4.0
2129	.96	2.84	3.80	4.12	5.50	3.12	.91	8.62	7.0	9.53	8.0	6.37	7.5
1277	......	......	2.33	2.25	3.03	7.19	5.99	10.22	9.0	16.21	12.0	3.32	3.0
1276	......	......	2.56	2.50	3.24	8.26	4.25	11.50	9.0	15.75	12.0	1.63	2.0
1578	......	......	......	.....	9.27	5.86	1.36	15.13	14.0	16.49	......	.. . .	. ....
1230	......	.....	1.10	.83	.69	9.25	2.26	9.94	8.0	12.20	......	4.72	4.0
1231	......	.. ...	......	......	4.11	6.88	4.08	10.99	11.0	15.07	......	2.15	2.0
1233	......	... ..	3.06	2.88	3.84	5.36	.74	9.20	8.0	9.94	......	3.42	2.0
1232	......	......	2.35	2.06	5.14	4.90	.68	10.04	8.0	10.72	......	5.71	4.0
2132	1.20	2.36	3.56	3.28	3.74	2.40	1.93	6.14	5.0	8.07	6.0	10.43	10.0
2105	.06	.84	.90	.62	7.58	2.64	2.47	10.22	10.0	12.69	11.0	1.06	1.0
2104	.25	1.46	1.71	1.65	5.87	2.52	2.38	8.39	8.0	10.77	9.0	2.94	3.0
2103	.27	1.22	1.49	1.24	7.23	2.33	2.43	9.56	9.5	11.99	11.5	2.06	2.0
2102	.19	1.35	1.54	1.32	5.09	2.34	2.03	7.43	7.0	9.46	8.0	2.39	2.0
1874	......	.....	2.85	2.46	......	......	1.01	10.38	9.0	11.39	10.0	4.10	4.0
1875	......	......	2.06	1.64	.....	......	1.31	8.27	8.0	9.58	9.0	3.56	3.0
1876	......	......	1.90	1.64	.....	......	1.73	9.33	9.0	11.06	10.0	2.45	2.0
1873	......	......	2.30	2.46	.. ...	....	......	......	5.0	27.72	28.0	......	.....
1879	......	.....	3.69	3.28	.....	......	.96	7.72	7.0	8.68	8.0	6.44	6.0
1877	......	. ....	2.61	2.46	.....	......	1.08	9.41	8.0	10.49	9.0	6.96	6.0
1885	......	......	2.42	1.60	......	......	1.61	9.72	9.0	11.33	10.0	3.69	2.0
1886	......	......	3.79	3.30	......	......	1.33	9.35	8.0	10.68	10.0	6.31	6.0
1887	......	......	3.02	2.40	......	......	2.90	7.29	7.0	10.19	9.0	5.83	6.0
1597	......	......	2.06	2.00	8.46	1.98	1.24	10.44	9.0	11.68	11.0	4.12	3.0
1880	......	......	1.36	1.50	.....	......	1.61	8.37	8.0	9.98	12.0	2.39	2.0
1620	......	......	2.57	2.00	6.44	4.72	1.85	11.16	9.5	13.01	11.0	2.77	2.0
1605	......	.....	1.82	.82	6.70	2.71	1.68	9.41	7.0	11.09	8.0	2.39	1.1
1604	......	.....	2.65	2.05	8.88	2.13	1.06	11.01	8.0	12.07	9.0	4.10	3.0
1234	......	......	1.23	1.15	6.23	2.68	2.44	8.91	8.0	11.35	9.0	2.25	2.0
1235	......	.....	2.37	2.25	7.33	2.42	1.85	9.75	8.5	11.60	10.5	2.61	2.0

Descriptive List of Manufacturers' Samples, 1899.

Station number.	Manufacturer, place of business and brand.
	PACKERS' UNION FERTILIZER CO., NEW YORK, N. Y.
1566	Packers' Union Animal Corn Fertilizer
1567	Packers' Union High Grade Potato Manure
2126	Packers' Union Universal Fertilizer
1619	Packers' Union Wheat, Oats and Clover Fertilizer
	PARMENTER & POLSEY FERTILIZER CO., PEABODY, MASS.
2123	Plymouth Rock Brand
2122	"P. and P." Potato Fertilizer
2124	Parmenter & Polsey Special Potato Fertilizer
2125	Star Brand Superphosphate
	EDWIN J. PHILBRICK, AUGUSTA, ME.
1888	Philbrick's Fertilizer
	PORTLAND RENDERING CO., PORTLAND, ME.
1616	Portland Rendering Co.'s Bone Tankage
	THE QUINNIPIAC CO., BOSTON, MASS.
1589	Quinnipiac Climax Phosphate
1590	Quinnipiac Corn Manure
1244	Quinnipiac Phosphate
1245	Quinnipiac Potato Manure
1591	Quinnipiac Potato Phosphate
1246	Quinnipiac Seeding Down Manure
	READ FERTILIZER CO., SYRACUSE, N. Y.
1396	Read's Practical Potato Special
1397	Read's Standard
1587	Read's Sure Catch
1555	Read's Vegetable and Vine
1865	Sampson Fertilizer
	RUSSIA CEMENT CO., GLOUCESTER, MASS.
1410	Essex Complete Manure for Corn, Grain and Grass
1411	Essex Complete Manure for Potatoes, Roots and Vegetables
2106	Essex Corn Fertilizer
2108	Essex Potato Fertilizer
1568	Essex XXX Fish and Potash
1891	Maine State Grange Chemicals
1892	Maine State Grange Potato Manure
2107	Maine State Grange Seeding Down Fertilizer
	SAGADAHOC FERTILIZER CO., BOWDOINHAM, ME.
1864	Dirigo Fertilizer
1863	Merrymeeting Superphosphate
1902	Sagadahoc Bone Meal
2127	Sagadahoc Special Potato Fertilizer
2128	Sagadahoc Superphosphate
1862	Yankee Fertilizer
	STANDARD FERTILIZER CO., BOSTON, MASS.
1414	Standard "A" Brand
1890	Standard Bone and Potash
1223	Standard Fertilizer
1221	Standard Guano
1603	Standard Special for Potatoes
	HENRY F. TUCKER CO., BOSTON, MASS.
1846	Original Bay State Bone Superphosphate
	JOHN WATSON, HOULTON, ME.
2133	Watson's Improved Potato Manure
	WILLIAMS & CLARK FERTILIZER CO., BOSTON, MASS.
1237	Americus Ammoniated Bone Superphosphate
1594	Americus Corn Phosphate
1595	Americus Potato Manure
1236	Royal Bone Phosphate for All Crops
1629	Williams & Clark Potato Phosphate
	A. F. YOUNG & CO., NEW YORK, N. Y.
2110	Young's Excelsior Potato Fertilizer

Analyses of Manufacturers' Samples, 1899.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	As ammonia or nitrates.	As organic.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
1566	.....	......	2.58	2.47	6.18	1.99	2.33	8.17	8.0	10.50	9.0	1.74	2.0
1567	......	......	2.11	2.06	6.50	1.49	1.96	7.99	8.0	9.95	9.0	8.05	6.0
2126	.08	1.02	1.10	.82	6.97	1.73	1.17	8.70	8.0	9.87	9.0	4.92	5.0
1619	.....	....	.25	....	.....	......	1.20	10.92	11.0	12.12	....	2.39	2.0
2123	.21	2.08	2.29	2.47	3.81	4.21	1.38	8.02	8.0	9.40	9.0	4.19	4.0
2122	.46	1.61	2.07	1.64	3.67	3.70	1.12	7.3	6.0	8.49	7.0	5.63	5 5
2124	1.69	1.29	2.98	3.29	4.21	4.27	1.29	8.48	8.0	9.77	9.0	7.41	7.0
2125	1.01	.79	1.80	1.64	3.80	3.54	1.15	7.34	7.0	8.49	8.0	2.60	2.5
1888	.38	1.65	2.03	2.00	2.00	5.19	1.74	7.19	7.0	8.93	9.0	5.58	5.0
1616	......	......	4.27	4.42	.....	7.34	12.06	7.34	......	19.40	18.6	......	.....
1589	.....	......	1.28	1.03	4.61	4.02	2.64	8.63	8.0	11.27	9.0	2.54	2.0
1590	....	......	2.22	2.06	9.15	1.24	1.29	10.39	9.0	11.68	10.0	2.27	1.5
1244	......	....	2.74	2.47	7.91	1.47	1.11	9.38	9.0	10.49	10.0	2.72	2.0
1245	......	.....	2.71	2.47	5.85	1.82	2.26	7.67	6.0	9.93	7.0	5.80	5.0
1590	......	......	2.15	2.05	8.78	1.64	.90	10.42	8.0	11.32	9.0	3.66	3.0
1246	......	......	1.23	.82	6.59	2.87	2.26	9.46	9.0	11.72	10.0	2.26	2.0
1396	......	.....	1.20	.82	3.39	1.55	.54	4.94	4.0	5.48	5.0	8.35	8.0
1397	......	......	1.15	.82	6.50	1.73	.92	8.23	8.0	9.15	9.0	4.33	4.0
1587	......	......	......	......	7.89	1.63	1.56	9 52	6.0	11.08	7.0	5.06	4.0
1555	......	......	1.96	1.65	5.04	1.21	1.55	6.25	6.0	7.80	7.0	7.96	8.0
1865	......	.....	1.97	1.65	......	......	1.51	6.75	6.0	8.26	7.0	4.42	4.0
1410	......	.....	4.00	3.70	3.02	6.39	2.51	9.41	7.0	11.92	9.5	10.52	9.5
1411	......	.....	3.96	3.70	2.60	5.54	2.84	8.14	7.0	10.98	9.0	9.18	8.5
2106	.52	1.72	2.24	2.00	5.31	4.03	4.14	9.34	9.0	13.48	11.0	3.33	3.0
2108	.63	1.55	2.18	2.00	5.50	4.18	4.08	9.68	9.0	13.76	11.0	5.57	5.0
1568	......	.....	2.68	2.10	8.00	2.63	2.56	10.63	9.0	13.19	12.0	2.75	2.25
1891	.82	1.58	2.40	2.50	2.45	5.71	3.89	8.16	8.0	12.05	12.0	4.72	4.0
1892	......	1.02	1.02	1.50	1.34	7.11	3.67	8.45	9.0	12.12	12.0	12.43	12.0
2107	....	1.91	1.91	1.50	3.19	4.24	6.36	7.43	7.0	13.79	13.0	5.69	5.5
1864	......	......	1.85	2.00	......	...	4.82	5.41	3.0	10.23	10.0	5.28	4.0
1863	......	......	1.50	1.50	......	......	3.78	7.72	5.0	11.50	9.0	2.73	2 0
1902	......	3.79	3.79	3.00	......	......	......	......	.....	18.42	20.0	.. ..	......
2127	2.15	.67	2.82	2.40	5.90	2.46	.75	8.36	6.0	9.11	10.0	8.11	7.0
2128	1.11	1.16	2.27	2 10	7.11	2.84	1.18	9.95	6.0	11.13	10.0	4.61	4.0
1862	......	....	.82	.50	......	......	2.12	9.03	3.0	11.15	7.0	2.77	1.5
1414	......	......	1.33	.82	4.84	3.08	1.96	7.92	7.0	9.88	9.0	1.71	1.0
1890	.....	......	......	......	6.94	3.03	1.51	9.97	8.0	11.48	10.0	4.10	2.5
1223	... .	......	2.44	2.00	7.36	2.64	1.96	10.00	8.0	11.96	10.0	2.67	2.0
1221	.....	......	1.75	1.25	6.59	2.02	1.09	8.61	6.5	9.70	8.5	3.69	3.0
1603	.....	......	2.43	2.05	8.00	2.98	1.03	10.98	8.0	12.01	9.0	3.78	3.0
1846	.....	......	2.40	2.06	.....	......	2.42	9.43	9.0	11.85	11.0	2.69	2.0
2133	.19	2.03	2.22	2.50	3.14	3.85	.84	6.99	6 00	7.83	7.00	6.52	5.00
1237	.....	.....	2.80	2.47	7.85	1.65	.79	9.50	9.0	10.29	10.0	2.63	2.0
1594	.....	......	2.27	2.06	8.76	.33	2.56	9.09	9.0	11.65	10.0	2.03	1.5
1595	......	.....	2.07	2.06	9.08	.96	1.24	10.04	8.0	11.28	9.0	3.53	3.0
1236	......	.....	1.26	1.03	6.20	3.11	2.23	9.30	7.0	11.54	8.0	2.26	2.0
1629	......	......	2.71	2.47	......	......	2.30	7.86	6.0	10.16	7.0	5.54	5.0
2110	2.22	1.14	3.36	2:88	5.02	.86	.29	5.88	5.5	6.17	.....	12.25	10.0

THE CHIEF PROVISIONS OF THE FERTILIZER LAW APPLYING TO MANUFACTURERS, IMPORTERS AND DEALERS.

The law for the regulation of the sale and analyses of commercial fertilizers makes the following requirements upon manufacturers, importers or dealers who propose to sell or offer for sale commercial fertilizers in the State:

1. *The Brand.* Each package shall bear, conspicuously printed, the following statements:

The number of net pounds contained in each package.

The name or trade mark under which it is sold.

The name of the manufacturer or shipper.

The place of manufacture

The place of business of manufacturer or shipper.

The percentage of nitrogen or its equivalent in ammonia.

The percentage of potash soluble in water.

The percentage of phosphoric acid in available form.

The percentage of total phosphoric acid.

2. *The Certificate.* There shall be filed annually between Nov. 15 and Dec. 15 with the Director of the Station a certificate containing an accurate statement of the brand. This certificate applies to the next succeeding calendar year. (Blanks for this purpose will be furnished on application to the Station.)

3. *Manufacturer's Samples.* There shall be deposited annually, unless excused by the Director under certain conditions, a sample of fertilizer, with an accompanying affidavit that this sample "corresponds within reasonable limits to the fertilizer which it represents."

4. *Analysis fee.* For each brand of fertilizer sold or offered for sale in the state there shall be paid annually to the Director of the Station "an analysis fee as follows: Ten dollars for the phosphoric acid and five dollars each for the nitrogen and potash, contained or said to be contained in the fertilizer."

5. *The license.* Upon receipt of the fee, the certificate and the sample (if required), the Director of the Station "shall issue a certificate of compliance."

[The full text of the law will be sent to those asking for it.]

CHAS. D. WOODS, *Director.*

FEEDING STUFF INSPECTION.

CHAS. D. WOODS.

Samples of the feeding stuffs coming under the inspection law, drawn in November, 1898, were analyzed and the results were published in January, 1899, as bulletin 48 of the Station. The inspectors visited most of the larger dealers again in January. At this time, samples were drawn from goods which had not been previously sampled and the results of the analyses are given in the pages which follow. In addition to the analyses here reported quite a large number of samples sent to the Station by correspondents have been analyzed and the results sent to them. In only one instance have correspondents' samples shown inferior goods and that is discussed below. The results of these analyses are not here reported as they agree substantially with the official samples.

Cotton Seed Meal. During the year about 200 samples of cotton seed meal have been examined, chiefly from the dairy sections of the State including the counties of Hancock, Waldo, Penobscot, Piscataquis and the whole of the State west of the Kennebec. Of these samples, two were low grade, *unguaranteed* goods in Hancock county. Upon writing the dealers calling attention to the violations of the law in selling unbranded goods, they took the necessary steps to conform to the law. Three samples of low grade goods found in Androscoggin and Penobscot counties were from the same wholesale house. The firm claimed that their shipper made a mistake in tagging one of the Androscoggin cotton seed meals and that instead of having tags guaranteeing 43 per cent of protein, the meal should have carried tags guaranteeing 25 per cent. The change of tags were made.

The other Androscoggin and the Penobscot county low grade meal was from the same car. This was one of ten cars bought by the wholesale house. As soon as notified of the inferior quality of the goods the guarantee was changed on the stock in the hands of the retailers and the order for the other cars (not then delivered) was countermanded. The law in this instance not only brought it about that the low grade goods in the State were properly guaranteed, but through its operation a number of cars of low grade cotton seed meal were kept out of the State.

[Continued on page 44.]

MANUFACTURERS AND PLACE OF SAMPLING.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8485	American Cotton Oil Co	Huntsville, Ala	Brownfield
8486	American Cotton Oil Co	Brinkley, Ark	Fryeburg
8487	American Cotton Oil Co	Little Rock, Ark	South Windham
8493	American Cotton Oil Co	Nashville, Tenn	West Falmouth
8505	American Cotton Oil Co	Nashville, Tenn	Lock Mills
8484	American Cotton Oil Co		Camden
8506	American Cotton Oil Co		Dover
8494	The Southern Cotton Oil Co	Memphis, Tenn	Bath
8495	The Southern Cotton Oil Co	Memphis, Tenn	Sebago Lake
8496	The Southern Cotton Oil Co	Memphis, Tenn	Hampden
8497	The Southern Cotton Oil Co	Memphis, Tenn	Bangor
8498	The Southern Cotton Oil Co	Memphis, Tenn	Westbrook
8499	The Southern Cotton Oil Co	Memphis, Tenn	Waldoboro
8500	The Southern Cotton Oil Co	Memphis, Tenn	Brunswick
8625	The Southern Cotton Oil Co	Memphis, Tenn	Phillips
8538	The Southern Cotton Oil Co	Memphis, Tenn	Berwick
8501	The Southern Cotton Oil Co	Newport, Ark	Houlton
8502	The Southern Cotton Oil Co	Newport, Ark	Newport
8503	The Southern Cotton Oil Co	Newport, Ark	Dexter
8504	The Southern Cotton Oil Co	Newport, Ark	Stroudwater
8478	O. Holway & Co		Greene
8617	O. Holway & Co		Readfield
8815	*		Dover
8523	R. B. Brown Oil Co	St. Louis, Mo	Pittsfield
8524	R. B. Brown Oil Co	St. Louis, Mo	Bath
8525		St. Louis, Mo	Dexter
8618		St. Louis, Mo	Norridgewock
8479	Chapin & Co	St. Louis, Mo	Belfast
8509	Chapin & Co	St. Louis, Mo	Milo
8510	Chapin & Co	St. Louis, Mo	Bangor
8511	Chapin & Co	St. Louis, Mo	Newport
8512	Chapin & Co	St. Louis, Mo	Belfast
8513	Chapin & Co	St. Louis, Mo	Portland
8514	Chapin & Co	St. Louis, Mo	Orrington
8541	Chapin & Co	St. Louis, Mo	North Fayette
8488	F. W. Brodé & Co	Memphis, Tenn	Hiram
8489	F. W. Brodé & Co	Memphis, Tenn	Cornish
8490	F. W. Brodé & Co	Memphis, Tenn	Richmond
8491	F. W. Brodé & Co	Memphis, Tenn	Dexter
8492	F. W. Brodé & Co	Memphis, Tenn	Winterport
8507	F. W. Brodé & Co	Memphis, Tenn	Westbrook
8508	F. W. Brodé & Co	Memphis, Tenn	East Poland
8619	F. W. Brodé & Co	Memphis, Tenn	Norridgewock
8645	F. W. Brodé & Co	Memphis, Tenn	Bethel
8650	F. W. Brodé & Co	Memphis, Tenn	Albion
8519	*		Norway
8520	*		Bangor
8521	*		Bucksport

* Brand incomplete. Name of manufacturer and place of business not given.

ANALYSES OF SAMPLES.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station Number.
Prime Cotton Seed Meal	43.44	43.00	9.64	9.00	8485
Prime Cotton Seed Meal	40.25	43.00	10.27	9.00	8486
Prime Cotton Seed Meal	45.50	43.00	9.86	9.00	8487
Prime Cotton Seed Meal	45.00	43.00	10.39	9.00	8493
Prime Cotton Seed Meal	45.69	43.00	10.54	9.00	8505
Prime Cotton Seed Meal	46.00	43.00	9.96	9.00	8484
Prime Cotton Seed Meal	45.63	43.00	11.01	9.00	8506
Prime Finely Ground Cotton Seed Meal	41.38	43.00	11.32	9.00	8494
Prime Finely Ground Cotton Seed Meal	42.50	43.00	10.51	9.00	8495
Prime Finely Ground Cotton Seed Meal	43.13	43.00	12.21	9.00	8496
Prime Finely Ground Cotton Seed Meal	44.19	43.00	12.38	9.00	8497
Prime Finely Ground Cotton Seed Meal	42.81	43.00	12.26	9.00	8498
Prime Finely Ground Cotton Seed Meal	42.88	43.00	11.55	9.00	8499
Prime Finely Ground Cotton Seed Meal	42.88	43.00	11.39	9.00	8500
Prime Finely Ground Cotton Seed Meal	46.50	43.00	10.58	9.00	8625
Prime Finely Ground Cotton Seed Meal	44.06	43.00	12.02	9.00	8538
Prime Finely Ground Cotton Seed Meal	45.25	41.00	10.48	9.00	8501
Prime Finely Gronnd Cotton Seed Meal	45.63	41.00	11.46	9.00	8502
Prime Finely Ground Cotton Seed Meal	45.50	41.00	10.63	9.00	8503
Prime Finely Ground Cotton Seed Meal	45.13	41.00	10.62	9.00	8504
Prime Memphis Cotton Seed Meal	24.44	25.50	7.35	5.71	8478
Prime Memphis Cotton Seed Meal	23.94	25.50	6.60	5.71	8617
Prime Memphis Cotton Seed Meal	45.13	43.00	13.49	9.00	8515
Prime Cotton Seed Meal	44.56	43.00	13.61	9.00	8523
Prime Cotton Seed Meal	45.75	43.00	12.83	9.00	8524
Prime Cotton Seed Meal	23.31	43.00	6.57	9.00	8525
Prime Cotton Seed Meal	22.38	43.00	6.77	9.00	8618
Cotton Seed Meal	42.50	43.00	10.06	9.00	8479
Cotton Seed Meal	45.50	43.00	9.25	9.00	8509
Cotton Seed Meal	45.25	43.00	10.10	9.00	8510
Cotton Seed Meal	44.81	43.00	10.44	9.00	8511
Cotton Seed Meal	42.38	43.00	9.37	9.00	8512
Cotton Seed Meal	42.63	43 00	11.02	9.00	8513
Cotton Seed Meal	45.06	43.00	9.54	9.00	8514
Cotton Seed Meal	44.25	43.00	10.23	9.00	8541
Owl Brand Cotton Seed Meal	43.50	43.00	12.89	9.00	8488
Owl Brand Cotton Seed Meal	45.13	43.00	9.38	9.00	8489
Owl Brand Cotton Seed Meal	45.63	43.00	13.40	9.00	8490
Owl Brand Cotton Seed Meal	43.94	43.00	10.98	9.00	8491
Owl Brand Cotton Seed Meal	48.69	43.00	10.31	9.00	8492
Owl Brand Cotton Seed Meal	45.50	43.00	9.96	9.00	8507
Owl Brand Cotton Seed Meal	45.06	43.00	10.15	9.00	8508
Owl Brand Cotton Seed Meal	44.81	43.00	10.73	9.00	8619
Owl Brand Cotton Seed Meal	42.80	43.00	10.19	9.00	8645
Owl Brand Cotton Seed Meal	45.44	43.00	10.34	9.00	8650
"Daisy Brand" Cotton Seed Meal	45.06	43.00	9.42	9.00	8519
"Daisy Brand" Cotton Seed Meal	42.88	43.00	14.08	9.00	8520
"Daisy Brand" Cotton Seed Meal	45.88	43.00	9.86	9.00	8521

MANUFACTURERS—Continued.

Station Number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8522	*		Portland
8643	*		Rumford
8482	D. M. Hawkins & Co	Memphis, Tenn	Bowdoinham
8483	D. M. Hawkins & Co	Memphis, Tenn	Portland
8624	D. M. Hawkins & Co	Memphis, Tenn	Farmington
8516	Hunter Bros		Dexter
8517	Hugh Petit & Co		Mechanic Falls
8526	J. E. Soper & Co		Yarmouth
8527	J. E. Soper & Co		Corinna
8529	J. E. Soper & Co		Mechanic Falls
8528	Dyersburg Oil & Fertilizer Co	Dyersburg, Tenn	Belfast
8536	Dyersburg Oil & Fertilizer Co	Dyersburg, Tenn	South Berwick
8539	Doten Grain Co		Waterboro
8530	*		Steep Falls
8531	*		Dexter
8534	*		Portland
8537	*		Springvale
8518	*		West Peru
8626	*		Wilton
8653	*		Augusta
8623	*		Winthrop
8622	*		Lewiston
8621	*		Livermore Falls
8620	*		North Anson
8532	*		Gorham
8533	*		South Paris
8644	*		Hartford
8481	*		Orland
8542	The Glucose Sugar Refining Co.		Richmond
8548	The Glucose Sugar Refining Co.		Belfast
8554	The Glucose Sugar Refining Co.		Camden
8544	The Glucose Sugar Refining Co.		Hampden
8551	The Glucose Sugar Refining Co.		East Poland
8543	The Glucose Sugar Refining Co.		Portland
8545	The Glucose Sugar Refining Co.		Bucksport
8546	The Glucose Sugar Refining Co.		Orrington
8547	The Glucose Sugar Refining Co.		Winterport
8549	The Glucose Sugar Refining Co.		Bangor
8550	The Glucose Sugar Refining Co.		Pittsfield
8552	The Glucose Sugar Refining Co.		Norway
8553	The Glucose Sugar Refining Co.		Dover
8630	The Glucose Sugar Refining Co.		Lewiston
8555	Charles Pope Glucose Co		Brunswick
8856	Charles Pope Glucose Co		Gorham
8857	Charles Pope Glucose Co		Bath
8858	Charles Pope Glucose Co		Portland
8859	Charles Pope Glucose Co		Wiscasset
8860	Charles Pope Glucose Co		Saco

* Brand incomplete. Name of manufacturer and place of business not given.

ANALYSES—Continued.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station Number.
"Daisy Brand" Cotton Seed Meal	45.38	43.00	10.32	9.00	8522
"Daisy Brand" Cotton Seed Meal	45.31	43.00	10.41	9.00	8643
Cotton Seed Meal	44.81	43.00	10.64	9.00	8482
Cotton Seed Meal	43.38	43 00	10.57	9.00	8483
Cotton Seed Meal	42.63	43.00	11.07	9.00	8624
Cotton Seed Meal	45.13	43.00	9.36	9.00	8516
Cotton Seed Meal	48.38	43.00	8.03	10.00	8517
Cotton Seed Meal	43.69	43.00	10.73	9.00	8526
Cotton Seed Meal	44.44	43.00	11.33	9.00	8527
Cotton Seed Meal	41.19	43.00	11.65	9.00	8529
Cotton Seed Meal	45.56	43.00	9.54	9.00	8528
Cotton Seed Meal	43.81	43.00	9.04	9.00	8536
Cotton Seed Meal	43.69	43.00	12.16	9.00	8539
Cotton Seed Meal	46.19	43.00	9.81	9.00	8530
Cotton Seed Meal	46.81	43.00	11.59	9.00	8531
Cotton Seed Meal	44.94	43.00	10.49	9.00	8534
Cotton Seed Meal	43.06	43.00	13.33	9.00	8537
Cotton Seed Meal	46.69	43.00	9.21	9.00	8518
Cotton Seed Meal	46.50	43.00	9.97	9.00	8626
Cotton Seed Meal	44.56	43.00	14.46	9.00	8653
Cotton Seed Meal	44.81	46.12	10.34	9.20	8623
Cotton Seed Meal	43.75	46.12	11.79	9.20	8622
Cotton Seed Meal	44.19	46.12	12.24	9.20	8621
Cotton Seed Meal	42.81	46.12	10.68	9.20	8620
Cotton Seed Meal	43.38	....	60.69	....	8532
Cotton Seed Meal	44.31	....	9.79	....	8533
Cotton Seed Meal	42.56	....	10.26	....	8644
Cotton Seed Meal	26.63	....	7.56	....	8481
Chicago Gluten Meal	37.44	38.00	3.27	2.00	8542
Chicago Gluten Meal	36.69	38 00	2.65	2.00	8548
Chicago Gluten Meal	37.19	38.00	3.02	2.00	8554
Chicago Gluten Meal	36.75	38.00	3.07	2.00	8544
Chicago Gluten Meal	38.81	38.00	2.75	2.00	8551
Chicago Gluten Meal	38.31	38.00	3.13	2.00	8543
Chicago Gluten Meal	34.50	38.00	3.61	2.00	8545
Chicago Gluten Meal	35.69	38.00	2.73	2.00	8546
Chicago Gluten Meal	38.06	38.00	3.36	2.00	8547
Chicago Gluten Meal	38.94	38.00	2.27	2.00	8549
Chicago Gluten Meal	37.94	38.00	2.71	2.00	8550
Chicago Gluten Meal	37.44	38.00	3.17	2.00	8552
Chicago Gluten Meal	38.25	38.00	3.27	2.00	8553
Chicago Gluten Meal	37.88	38.00	3.16	2.00	8630
Cream Gluten Meal	32.63	37.12	4.91	3.20	8555
Cream Gluten Meal	35.25	37.12	3.12	3.20	8551
Cream Gluten Meal	34.56	37.12	4.65	3.20	8557
Cream Gluten Meal	33.56	37.12	4.84	3.20	8558
Cream Gluten Meal	32.19	37.12	4.39	3.20	8559
Cream Gluten Meal	30.13	37.12	1.84	3.20	8560

MANUFACTURERS—Continued.

Station Number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8633	Charles Pope Glucose Co	....	Lewiston ....
8562	National Starch Manf'g Co	Indianapolis, Ind..	Bowdoinham ......
8568	National Starch Manf'g Co	Indianapolis, Ind..	Milo ....
8569	National Starch Manf'g Co	Indianapolis, Ind..	Foxcroft . ...
8563	National Starch Manf'g Co	Des Moines, Ia.....	Old Town ....
8561	National Starch Manf'g Co	Des Moines, Ia. ...	Sebago Lake ....
8564	National Starch Manf'g Co	Des Moines, Ia.....	Brunswick ....
8565	National Starch Manf'g Co	Des Moines, Ia.....	Dexter.............
8567	National Starch Manf'g Co	Des Moines, Ia.....	Norway .. ..
8629	National Starch Manf'g Co	Des Moines, Ia.....	Livermore Falls ...
8566	National Starch Manf'g Co	Des Moines, Ia.....	Steep Falls ....
8627	National Starch Manf'g Co	Des Moines, Ia.....	Bingham ....
8628	National Starch Manf'g Co	Des Moines, Ia.....	Winthrop ....
8570	The Glucose Sugar Refining Co.	....	South Paris ....
8571	The Glucose Sugar Refining Co.	....	West Paris ....
8572	The Glucose Sugar Refining Co.	....	Guilford ....
8573	The Glucose Sugar Refining Co.	....	Damariscotta ......
8631	The Glucose Sugar Refining Co.	....	Farmington ....
8632	The Glucose Sugar Refining Co.	.. ..	Readfield Depot ...
8574	International Milling Co........	....	Brunswick ....
8575	International Milling Co........	....	Richmond ....
8634	International Milling Co........	....	Lewiston ....
8576	The Cleveland Linseed Oil Co..	....	Brownfield ....
8648	Mayflower Mills	Fort Wayne, Ind...	Bath ....
8577	E. W. Blatchford & Co	Chicago, Ill	Brunswick ....
8587	American Cereal Co...........	....	Belfast ....
8588	American Cereal Co.............	....	Bowdoinham ......
8589	American Cereal Co............	....	Bangor ....
8590	American Cereal Co.	....	Bucksport...... ....
8591	American Cereal Co......	....	Portland ....
8592	American Cereal Co............	....	Foxcroft ....
8593	American Cereal Co............	....	Island Falls ....
8594	American Cereal Co............	....	Bethel ....
8595	American Cereal Co...........	....	Waldoboro ....
8636	American Cereal Co......... ...	....	Farmington .. ..
8637	American Cereal Co.	....	Bingham ....
8596	S. A. & J. H. True Co	....	Bath ....
8597	S. A. & J. H. True Co	....	Portland . ...
8598	Commercial Milling Co....	....	Ashland ....
8599	David Oliver.....................	Joliet, Ill	Fryeburg ....
8600	The H-O Co	Buffalo, N. Y	Bowdoinham ......
8601	The H-O Co	Buffalo, N. Y	South Windham ...
8602	The H-O Co	Buffalo, N. Y	Portland ....
8635	The H-O Co	Buffalo, N. Y	Phillips ....
8639	....	....	Winthrop ....
8603	The H-O Co	Buffalo, N. Y	North Yarmouth...
8604	The H-O Co	Buffalo, N. Y	North Yarmouth...
8605	The H-O Co	Buffalo, N. Y	North Yarmouth...

ANALYSES—Continued.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Cream Gluten Meal	34.31	37.12	3.91	3.20	8633
King Gluten Meal	35.31	32.00	4.07	16.06	8562
King Gluten Meal	34.50	32.00	6.78	16.00	8568
King Gluten Meal	36.25	32.00	6.17	16.00	8569
King Gluten Meal	32.06	32.00	15.90	16.00	8563
King Gluten Meal	32.88	32.00	16.38	16.00	8561
King Gluten Meal	33.88	32.00	16.91	16.00	8564
King Gluten Meal	33.19	32.00	16.46	16.00	8565
King Gluten Meal	33.94	32.00	14.50	16.00	8567
King Gluten Meal	33.75	32.00	16.79	16.00	8629
King Gluten Meal	34.94	34.26	15.71	14.65	8566
King Gluten Meal	32.06	32.00	15.84	9.00	8627
King Gluten Meal	32.38	32.00	12.89	12.00	8628
Buffalo Gluten Feed	27.00	25.50	4.00	4.00	8570
Rockford Diamond Gluten Feed	24.56	24.20	4.54	3.76	8571
Rockford Diamond Gluten Feed	25.25	24.20	4.16	3.76	8572
Rockford Diamond Gluten Feed	21.31	24.20	5.02	3.76	8573
Rockford Diamond Gluten Feed	25.31	24.20	5.03	3.76	8631
Rockford Diamond Gluten Feed	25.25	24.20	4.67	3.76	8632
Sucrene Oil Meal	26.44	24.75	3.33	3.50	8574
Sucrene Oil Meal	23.63	24.75	3.26	3.50	8575
Sucrene Oil Meal	26.44	24.75	3.44	3.50	8634
Cleveland Flax Meal	37.00	39.00	3.03	1.50	8576
Old Process Linseed Meal	25.44	....	8.92	....	8648
Blatchford's Calf Meal	24.94	....	4.41	....	8577
Victor Corn and Oat Feed	11.25	9.46	4.65	3.92	8587
Victor Corn and Oat Feed	10.69	9.46	4.78	3.92	8588
Victor Corn and Oat Feed	8.63	9.46	3.44	3.92	8589
Victor Corn and Oat Feed	8.75	9.46	3.72	3.92	8590
Victor Corn and Oat Feed	8.56	9.46	3.80	3.92	8591
Victor Corn and Oat Feed	9.13	9.46	3.82	3.92	8592
Victor Corn and Oat Feed	9.63	9.46	4.63	3.92	8593
Victor Corn and Oat Feed	7.81	9.46	3.23	3.92	8594
Victor Corn and Oat Feed	10.38	9.46	5.12	3.92	8595
Victor Corn and Oat Feed	8.56	9.46	3.68	3.92	8636
Victor Corn and Oat Feed	9.69	9.46	3.66	3.92	8637
Corn and Oat Feed	9.13	9.63	3.42	4.23	8596
Corn and Oat Feed	9.19	9.63	3.39	4.23	8597
Ground Corn and Oats	9.44	....	2.89	....	8598
Lakeside Corn and Oat Feed	8.44	9.50	3.24	3.75	8599
Dundee Corn and Oat Feed	8.88	8.38	3.30	2.95	8600
Dundee Corn and Oat Feed	9.00	8.38	3.11	2.95	8601
Dundee Corn and Oat Feed	8.19	8.38	2.69	2.95	8602
Dundee Corn and Oat Feed	9.25	8.38	3.67	2.95	8635
Monarch Corn and Oat Feed	12.31	10.25	7.12	7.49	8639
The H-O Co.'s Standard Dairy Feed	16.50	18.75	4.48	7.25	8603
The H-O Co.'s Horse Feed	11.00	12.30	4.42	4.90	8604
The H-O Co.'s Poultry Feed	17.31	16.80	5.62	7.00	8605

MANUFACTURERS—Concluded.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8606	The H-O Co	Buffalo, N. Y.	Bowdoinham
8607	The American Cereal Co	....	Brunswick
8608	The American Cereal Co	....	North Yarmouth
8609	The American Cereal Co	....	Westbrook
8610	The American Cereal Co	....	Richmond
8611	The American Cereal Co	....	Bath
8612	The American Cereal Co	....	Portland
8613	The American Cereal Co	....	Belfast
8614	The American Cereal Co	....	Foxcroft
8615	The American Cereal Co	....	Waldoboro
8616	W. H. Haskell & Co	Toledo, O.	West Falmouth
8638	Andrew Cullen	....	Madison
8480	Northwestern Fertilizer Co	....	Portland
8585	Northwestern Fertilizer Co.	....	Winterport
8578	Bradley Fertilizer Co	....	Bangor
8579	Bradley Fertilizer Co	....	Portland
8583	Bowker Fertilizer Co	Boston, Mass.	Portland
8580	Bowker Fertilizer Co	Boston, Mass	Bangor
8581	Bowker Fertilizer Co	Boston, Mass	Portland
8582	Bowker Fertilizer Co	Boston, Mass	Waldoboro
8584	B. Randall	East Boston, Mass.	Bowdoinham
8586	American Fertilizer Co	....	Bowdoinham

[Continued from page 37.]

In March a correspondent in Cumberland county sent a sample of very low grade cotton seed meal to the Station. This was one of two cars brought into the State by a wholesale house. As soon as their attention was called to the matter, the sale of the meal was stopped, that in the hands of the retailer was returned to them and together with the other car was sold into New Hampshire, which State is not protected by a law regulating the sale of feeding stuffs. This lot of meal was one of the poorest examined by the Station, and probably occasioned considerable loss from the shrinkage of milk flow as nearly a carload of it was sold in two towns before its poor quality was known. Much of the meal was fine and of fairly good appearance. The dealers claim that it has a *commercial* value equal to high grade cotton seed meal as fineness and brightness determine that. The meal had an *agricultural* value of less than one-half its guarantee.

In none of the above instances was there any evident intention of fraud. The dealers as soon as notified, and without wait-

ANALYSES—Concluded.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
The H-O Co.'s Poultry Feed	17.44	16.80	5.87	7.00	8606
American Cereal Co.'s Poultry Food	13.44	....	5.79	....	8607
American Cereal Co.'s Poultry Food	13.69	....	5.93	....	8608
Quaker Oat Feed	9.25	12.03	3.99	3.49	8609
Quaker Oat Feed	9.63	12.03	3.08	3.49	8610
Quaker Oat Feed	8.94	12.03	3.46	3.49	8611
Quaker Oat Feed	10.75	12.03	3.77	3.49	8612
Quaker Oat Feed	10.81	12.03	4.00	3.49	8613
Quaker Oat Feed	7.75	12.03	3.04	3.49	8614
Quaker Oat Feed	11.69	12.03	4.30	3.49	8615
Haskell's Oat Feed	9.50	9.62	6.51	7.66	8616
Crescent Oat Feed	7.81	10.90	2.99	3.70	8638
Horse Shoe Brand Ground Beef Cracklings for Poultry	64.63	60.00	19.61	16.00	8480
Horse Shoe Brand Ground Beef Cracklings for Poultry	66.44	60.00	16.95	16.00	8585
Bradley's Superior Meat Meal	52.25	40.00	9.40	15.00	8578
Bradley's Superior Meat Meal	53.94	40.00	9.48	15.00	8579
Bowker's Pure Beef Scraps	51.88	....	14.89	....	8583
Bowker's Animal Meal	42.13	30.00	12.45	5.00	8580
Bowker's Animal Meal	46.94	30.00	10.69	5.00	8581
Bowker's Animal Meal	39.69	30.00	11.21	5.00	8582
Pure Beef Scraps	47.44	....	23.08	....	8584
American Poultry Meal	38.06	....	22.44	....	8586

ing for an official notice from the Secretary of Agriculture, either stopped the sale of the goods, or made a guarantee corresponding to the facts. Although the law did not keep these goods out of the State, it has completely prevented their being knowingly sold.

To avoid this class of goods, dealers and consumers should use only reliable brands of cotton seed meal and should send samples of all goods to the Station for free analysis as offered on the last page of this bulletin.

Gluten Meal. With one exception, Chicago Gluten Meal was well up to guarantee in protein. The manufacturers are not sending the Indianapolis King Gluten into the State at present. The Des Moines King Gluten is well up to guarantee. The Chas. Pope Glucose Co.'s Cream Gluten meal continues to fall below the guarantee. Unless the quality is changed for the better, the consumer cannot count on Cream Gluten Meal to carry more than 33 per cent protein.

SUMMARY OF ANALYSES.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
American Cotton Oil Co.'s Prime Cotton Seed Meal.		Highest	46.00	....	11.01	
	7	Lowest	40.25	43.00	9.64	9.00
		Average	44.50	....	10.24	
Southern Cotton Oil Co.'s Prime Finely Ground Cotton Seed Meal, Memphis, Tenn., Mill.		Highest	46.50	....	12.38	
	9	Lowest	41.38	43.00	10.51	9.00
		Average	43.37	... .	11.58	
Southern Cotton Oil Co.'s Prime Finely Ground Cotton Seed Meal, Newport, Ark., Mill.		Highest	45.63	....	11.46	
	4	Lowest	45.13	41.00	10.48	9.00
		Average	45.38	....	10.80	
O. Holway & Co.'s Prime Memphis Cotton Seed Meal.		Highest	24.44	....	7.35	
	2	Lowest	23.94	25.50	6.60	5.71
		Average	24.19	... .	6.98	
Manufacturer unknown. Prime Memphis Cotton Seed Meal.	1	....	45.13	43.00	13.49	9.00
R. B. Brown Oil Co.'s Prime Cotton Seed Meal.		Highest	45.75	....	13.61	
	2	Lowest	44.56	43.00	12.83	9.00
		Average	45.66	....	13.22	
Chapin & Co.'s Cotton Seed Meal.		Highest	45.50	....	11.02	
	8	Lowest	42.38	43.00	9.25	9.00
		Average	44.05	....	10.00	
F. W. Brodé & Co.'s Owl Brand Cotton Seed Meal.		Highest	48.69	....	13.40	
	10	Lowest	42.80	43.00	9.38	9.00
		Average	45.06	....	10.83	
"Daisy Brand" Cotton Seed Meal.		Highest	45.88	....	14.08	
	5	Lowest	42.88	43.00	9.42	9.00
		Average	44.90	....	10.82	
D. M. Hawkins & Co.'s Cotton Seed Meal.		Highest	44.81	....	11.07	
	3	Lowest	42.63	43 00	10.57	9 00
		Average	43.61	....	10.76	
Hunter Bros.' Cotton Seed Meal.	1	....	45.13	43.00	9.36	9.00
Hugh Petit & Co.'s Cotton Seed Meal.	1	....	48.38	43.00	8.03	10.00
J. E. Soper & Co.'s Cotton Seed Meal.		Highest	44.44	....	11.65	
	3	Lowest	41.19	43.00	10.73	9.00
		Average	43.11	....	11.27	
Dyersburg Oil & Fertilizer Co.'s Cotton Seed Meal.		Highest	45.56	....	9.54	
	2	Lowest	43.81	43.00	9.04	9.00
		Average	44.69	....	9.21	
Doten Grain Co.'s Cotton Seed Meal.	1	....	43.69	43.00	12.16	9.00
Manufacturers unknown. Cotton Seed Meal.		Highest	46.81	....	14.46	
	7	Lowest	43.06	43.00	9.21	9.00
		Average	45.54	....	11.27	
Manufacturers unknown. Cotton Seed Meal.		Highest	44.81	....	12.24	
	4	Lowest	42.81	46.12	10.34	9.20
		Average	43.89	....	11.26	

SUMMARY OF ANALYSES—Continued.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
The Glucose Sugar Refin'g Co.'s Chicago Gluten Meal.	14	Highest	38.94	....	3.61	
		Lowest	34.50	38.00	2.27	2.00
		Average	37.42	....	3.01	
Charles Pope Glucose Co.'s Cream Gluten Meal.	7	Highest	35.25	... .	4.91	
		Lowest	30.13	37.12	1.84	3.20
		Average	33.23	....	3.95	
National Starch Manf'g Co.'s King Gluten Meal, Indianapolis, Ind., Mill.	3	Highest	36.25	....	6.78	
		Lowest	34.50	32.00	5.67	16.00
		Average	35.35	....	8.35	
National Starch Manf'g Co.'s King Gluten Meal, Des Moines, Iowa, Mill.	8	Highest	34.94	....	16.91	
		Lowest	32.06	32.00	12.89	16.00
		Average	33.28	....	15.63	
The Glucose Sugar Refin'g Co.'s Buffalo Gluten Feed.	1	.. ..	27.00	25.50	4.00	4.00
The Glucose Sugar Refin'g Co.'s Rochford Diamond Gluten Feed.	5	Hihgest	25.31	....	5.03	
		Lowest	21.31	24.20	4.16	3.76
		Average	24.34	....	4.69	
International Milling Co.'s Sucrene Oil Meal.	3	Highest	26.44	....	3.44	
		Lowest	23.63	24.75	3.26	3.50
		Average	25.50	....	3.34	
The Cleveland Linseed Oil Co.'s Cleveland Flax Meal.	1	... .	37.00	39.00	3.03	1.50
Mayflower Mills Old Process Linseed Meal.	1	....	25.44	....	8.92	
E. W. Blatchford & Co.'s Blatchford's Calf Meal.	1	....	24.94	....	4.41	
American Cereal Co.'s Victor Corn and Oat Feed.	11	Highest	11.25	....	5.12	
		Lowest	8.56	9.46	3.23	3.92
		Average	9.37	....	4.05	
S. A. & J. H. True Co.'s Corn and Oat Feed.	2	Highest	9.19	....	3.42	
		Lowest	9.13	9.63	3.39	4.23
		Average	9.16	....	3.41	
Commercial Milling Co.'s Ground Corn and Oats.	1	....	9.44	....	2.89	
David Oliver's Lakeside Corn and Oat Feed.	1	....	8.44	9.50	3.24	3.75
The H-O Co.'s Dundee Corn and Oat Feed.	4	Highest	9.25	....	3.67	
		Lowest	8.19	8.38	2.69	2.95
		Average	8.83	....	3.19	
Monarch Corn and Oat Feed.	1	....	12.31	10.25	7.12	7.49
The H-O Co.'s Standard Dairy Feed.	1	....	16.50	18.75	4 48	7.25
The H-O Co.'s Horse Feed.	1	....	11.00	12.30	4.42	4.90
The H-O Co.'s Poultry Feed.	2	Highest	17.44	....	5.87	
		Lowest	17.31	16.80	5.62	7.00
		Average	17.38	....	5.75	

SUMMARY OF ANALYSES—Concluded.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
The American Cereal Co.'s		Highest	13.69	.. ..	5.93	
Poultry Food.	2	Lowest	13.44	....	5.79	
		Average	13.57	....	5.86	
The American Cereal Co.'s		Highest	11.69	....	4.30	
Quaker Oat Feed.	7	Lowest	7.75	12.03	3.04	3.49
		Average	9.83	....	3.66	
W. H. Haskell & Co.'s Haskell's Oat Feed.	1	....	9.50	9.62	6.51	7.66
Andrew Cullen's Crescent Oat Feed.	1	....	7.81	10.90	2.99	3.70
Northwestern Fertilizer Co.'s		Highest	66.44	....	19.61	
HorseShoeBrand Ground Beef	2	Lowest	64.63	60.00	16.95	16.00
Crackings for Poultry.		Average	65.54	....	18.28	
Bradley Fertilizer Co.'s		Highest	53.94	....	9.48	
Bradley's Superior Meat Meal	2	Lowest	52.25	40.00	9.40	15.00
		Average	53.10	....	9.44	
Bowker Fertilizer Co.'s Bowker's Pure Beef Scraps.	1	....	51.88	....	14.89	
Bowker Fertilizer Co.'s		Highest	46.94	....	12.45	
Bowker's Animal Meal.	3	Lowest	39.69	30 00	10.69	5.00
		Average	42.92	....	11.45	
B. Randall's Pure Beef Scraps.	1	....	47.44	....	23.08	
American Fertilizer Co.'s American Poultry Meal.	1	....	38.06	....	22.44	

[Blank for forwarding samples of feeding stuffs for free analysis.]

....................189....

(Do not write here.)

Station No............ Chas. D. Woods, Director

Received............ Agricultural Experiment Station,

Orono, Maine.

SIR: I send you to-day, by mail, a fair sample of a feeding stuff. In addition to the red tax tag each package carried the following statements.

(In case these statements are on a tag, it can be sent instead of a copy of the statement.)

Name of goods ....

Name of Manufacturer ....

Per cent. protein............. Per cent. fat...............

The sample was taken by me in accordance with the directions on the back of this sheet, and fairly represents the stock from which it was drawn.

Signature,..................................

Post Office address,..........................

Witness:* The above-described sample was taken in my presence.

Signature of Witness,............................

Name of Dealer,................................

Address, ...

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* The witness should be the dealer or his representative, a postmaster, or town or city officer.

FREE ANALYSIS OF FEEDING STUFFS.

The Station officers take pains to obtain for analysis samples of all feeding stuffs coming under the law, but the co-operation of consumers is essential for the full and timely protection of their interests. Whenever anyone believes that this law is being evaded in any way, he is requested to notify the Director of the Station.

The Station will promptly analyze samples of feeding stuffs taken in accordance with the following directions and report the results to the interested parties. Dealers and consumers are urged to avail themselves of this offer.

DIRECTIONS FOR SAMPLING.

The sample should fairly represent the feeding stuff and is best obtained as follows:

Open one or more full and unbroken packages, and mix well together the contents of each for a foot in depth, take out three cupfuls from different parts of the mixed portions of each package, pour them one over another upon a paper, intermix thoroughly and fill a tin spice or baking powder box from the mixture. Detach this leaf, fill out the blank on the opposite side, securely wrap the box and blank in paper and send by mail to the

Agricultural Experiment Station,
Orono, Maine.

THE SPRAYING OF PLANTS.

W. M. Munson.

LET US SPRAY.

"It is conservatively estimated that the annual yield of all crops is lessened about 25 per cent. by the attacks of injurious insects and fungous diseases. Experiments have demonstrated that at least 75 per cent. of this loss can be prevented by the use of simple remedies applied by means of a spray pump. Expressed in figures, the annual loss would represent about $500,000,000 in the United States alone. Of this amount, 75 per cent., or $375,000,000 can be saved by spraying."*

The above paragraph represents the facts concerning the importance of spraying, at the present time. Previous reports † have detailed the experiments made along this line at this Station, and equally striking results have been obtained at other stations. Spraying has ceased to be an experiment. The beneficial results obtained at the experiment stations have been fully corroborated in practical field work, and now it is important to know the *how* and the *why* of spraying. In other words, in order that the best results may be obtained, spraying must be done intelligently.

Success in spraying, as in most of the work in life, is largely a matter of detail. Little things, seemingly unimportant, all affect the results obtained. Failure may usually be attributed to lateness of application, carelessness in applying or in preparing the material, or to defective apparatus.

WHY SPRAY?

Spraying is plant insurance. It is, with few exceptions, a *preventive* measure for many of the ills that plants are heir to, and *not* a cure. There are several distinct classes of enemies

* Weed, Spraying for Profit, p. 9.
† Rep. Maine Expt. Sta., 1891, p. 99; 1892, p. 92; 1893, p. 124.

that must be met, each in a different way. These enemies may be grouped first under the two general heads,—insects and fungi.

The insect enemies are naturally divided into distinct classes which must be met in very different ways, and the same is true of the fungi. The first class of insect enemies includes those that, either in the mature form or as larvæ, eat the plant tissue; e. g., the plum curculio, the codling moth, the currant worm, the tent-caterpillar, the potato beetle, etc. These are very readily destroyed by the application of some form of arsenic, as Paris green, to the parts which will be eaten.

Another class of insects, e. g., the plant lice and some of the scale insects, obtain their food by sucking the juices of the plant and, therefore, are not affected by an application of poison. These must be overcome by an external irritant, such as kerosene, or an alkali like caustic soda or strong soap suds, or by some material that will close the breathing pores and thus stop respiration, e. g., pyrethrum or hellebore (in the dry form hellebore acts in both ways.)

Fungi (singular, *fungus*) are simply low forms of plant life which feed upon organic matter, either living or dead. Those which grow on living tissues—*parasitic fungi*—are the ones with which we are specially concerned. It is these which cause many of the blights and rusts, and smuts and scabs and mildews of various plants. Fungi are propagated by means of minute, microscopic bodies, called spores, which are carried from place to place by the wind and by insects, birds and other animals. A spore, falling upon the surface of a leaf, or the growing tip of a branch, if in the presence of moisture and the usual summer temperature, germinates in a manner very similar to that of a seed. If the surface of the leaf or fruit is coated with some material which is destructive to the young fungus, as the spore germinates, all the damage from the parasite is warded off. If, on the other hand, there is even a small spot that is not coated, there is opportunity for the parasite to obtain a foothold. With few exceptions, after the parasite has once attacked the plant, spraying is of little if any avail.

WHEN TO SPRAY.

The time of spraying will depend upon the purpose in view, but in *no case* should spraying be done when the plants are in full bloom. Spraying at this time will often interfere with the fertilization of the flowers, and consequently reduce the crop of fruit, while there is much needless destruction of bees and other insects which work upon the flowers.

In general, spray *early*. "Delays are dangerous." Fruit trees should be sprayed before the buds open, potatoes before disease or insects appear. Subsequent treatment will depend very largely upon the nature of the season; if very wet, it may be necessary to spray every two or three weeks; if relatively dry, three or four treatments may be sufficient.*

HOW TO SPRAY.

Insecticides and fungicides are more effective if applied in a liquid rather than in a dry form, since they adhere to the foliage better. *Sprinkling is not spraying.* The best results are obtained from the use of a fine spray or mist forcibly applied to the foliage; and so far as possible, it should reach the under sides of the leaves. A fine mist is preferable to a coarse spray, as there is much less waste of material and much less danger of injury to the foliage. A single dash of the mist is better than continued soaking, as in the latter case the material gathers in drops and runs off or injures the foliage.

As already stated, spraying for fungi is a preventive measure rather than a cure. If the surface of the leaf is not completely covered on both sides, with the protective coating, there is still danger of attack. The spores of the fungus may fall upon the smallest unprotected spot.

Again, while young insects may be killed by a very small dose of poison, a much larger amount will be required as they grow older. So spraying should be commenced early, that the first meal of a young insect may be his last, and in order to insure this end, the poison must be finely divided and evenly distributed.

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* The Station has prepared specific directions for spraying; (1) Apples and other fruit trees; (2) potatoes. These will be sent free to any address upon application.

THE MATERIALS FOR SPRAYING.

The materials used in spraying are mainly of two general kinds, fungicides used in killing fungi, and insecticides, used in killing insects. The principal fungicides are Bordeaux mixture and sulphide of potassium. The more important insecticides are arsenic, in some form (usually Paris green), kerosene and tobacco.

*Bordeaux Mixture.** This is the fungicide *par excellence* for general use, and its preparation is a matter of considerable importance, The formula in general use at present is known as the "4, 4, 40" formula. In other words the mixture consists of 4 lbs. copper sulphate, 4 lbs. fresh lime and 40 gallons of water. The copper sulphate should be dissolved in three or four gallons of water in a wooden or earthen vessel and the lime (which must be absolutely fresh) should be slaked in a separate vessel, and diluted with water till it is of a milky nature. When ready for use, the two solutions may be mixed in a third vessel, care being taken to stir constantly during the process. In every case, the mixture should be passed through a sieve of number 50 brass wire cloth, or through cheese cloth backed by common window screen wire. This straining is necessary to prevent clogging of the nozzle.

Potassium Sulphide. Potassium sulphide, or "liver of sulphur" is specially valuable as a preventive of gooseberry mildew and for use in the greenhouse. In using this material four ounces of the sulphide are dissolved in ten gallons of water.

Paris Green. This material is the one which is always reliable for the destruction of leaf-eating insects. Many other forms of arsenic have been recommended, but none have proved so generally satisfactory as Paris green.† It is practically insolu-

*More specific directions for the preparation of Bordeaux mixture will be found in the special directions for spraying, already referred to. While the use of freshly prepared Bordeaux is to be preferred, there are "prepared" Bordeaux mixtures that are used by some who doubt their ability to make the mixture. These prepared mixtures may be obtained from most dealers in spraying apparatus. The two brands which have come to the notice of the writer are the "Lenox" made by the Lenox Sprayer Company, Pittsfield, Mass., and the "Lion," made by James A. Blanchard, New York City.

† Among the cheaper substitutes for Paris green are "Green Arsenite," "Paragrene," "Emerald Green," "Arsenite of Soda," "Arsenate of Lead," etc. With the exception of the last named, which is largely used by the Gypsy Moth Commission of Massachusetts, the substitutes are still to be considered as experimental.

ble in water, but as there is usually present a small amount of soluble arsenic, it is always well to add a little fresh lime to the mixture before applying, that injury to the foliage may be averted. Paris green is generally mixed with water in the proportion of 1 pound to 200 gallons. If lime is added, however, a pound to 100 gallons may be used.

Kerosene. Kerosene is the specific for all sucking insects. It kills by contact and, owing to its cheapness and efficiency, will probably remain the most valuable insecticide for this class of insects. The form in which it is usually applied is the soap emulsion,* but there are now several forms of spray pumps which make a mechanical mixture of kerosene and water, thus greatly reducing the labor.

Tobacco. A strong decoction of tobacco ("tobacco tea") is often used with success in destroying the lice upon rose bushes and tender, soft-wooded plants.

WHAT APPARATUS IS NECESSARY?

In order that the best results may be obtained, suitable apparatus is needed. Such apparatus consists of a good force-pump, with one or two lines of discharge hose, nozzles, a barrel or tank for holding the mixture and a wagon for carrying all.

The Pump. The pump should be large enough to supply two lines of discharge pipe, so that one man may pump while two others distribute the spray. The small bucket and knapsack pumps do very well for a limited amount of spraying, but in field work, toys will not answer. All parts of the pump that are subject to wear should be of brass and should be carefully adjusted.

The Hose. Two pieces of one-half inch hose, of sufficient length to give freedom to the operator are needed. About fifteen feet is the length usually preferred.

The Nozzle. The nozzle is one of the most important parts of the spraying apparatus. It should throw a fine mist-like spray, and should be easily cleaned. The one in most common use is, perhaps, the Vermorel. The McGowen is one of the best for tall trees.

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* One-half pound hard soap, 1 gallon boiling water, 2 gallons kerosene. Dissolve the soap in the water, add the kerosene and churn through a force pump for ten minutes. For use, dilute ten to twenty times with water.

The Barrel. A kerosene barrel holding about fifty gallons, or a hogshead holding 100 gallons is the best tank. It can be placed upon the side or stood on end, and a small opening made in which to place the pump and to stir the liquid.

The Wagon. Any low wagon with wide tires is suitable. For convenience in turning, a two-wheeled cart is to be preferred.

WHERE MAY APPARATUS BE OBTAINED?

Pumps and nozzles are made by many reliable firms and may be obtained at comparatively low cost by ordering directly from the manufacturers. With so many good pumps on the market, it is not easy to state which is the best.

Of the prominent manufacturers of spraying apparatus, the following is a partial list: Morrill & Morley, Benton Harbor, Mich.; The Field Force Pump Company, Lockport, N. Y.; The Goulds Mfg. Co., Seneca Falls, N. Y.; The Deming Company, Salem, O. (Chas. J. Jager & Co., No. 174 High St., Boston, New England Agents); The Lenox Sprayer Co., Pittsfield, Mass.; F. E. Myers & Bro., Ashland, Ohio; W. & B. Douglass, Middletown, Conn.; The P. C. Lewis Company, Catskill, N. Y.; William Stahl, Quincy, Ill.; The Aspinwall Mfg. Co., Jackson, Mich. All these firms are reliable and will send catalogues on application.

The manufacturers of apparatus were requested to send to the Experiment Station a list of their agents in Maine. The following names were returned: Kendall & Whitney, Portland; C. M. Conant & Co., Bangor; R. B. Dunning & Co., Bangor; A. L. & E. F. Goss Co., Lewiston; George B. Haskell & Co., Lewiston; O. F. Frost, Monmouth; J. C. Crosby, Cranberry Isle; F. A. Hussey, Topsham; G. A. Perkins, Auburn; F. L. Howe, Fairfield; L. H. Strout, Kent's Hill; G. J. Riney, Gardiner.

FERTILIZER INSPECTION.

CHAS. D. WOODS, Director.
J. M. BARTLETT, Chemist in charge of Fertilizer Analysis.

The law regulating the sale of commercial fertilizers in this State calls for two bulletins each year. The first of these contains the analyses of the samples received from the manufacturer, guaranteed to represent, within reasonable limits, the goods to be placed upon the market later. The second bulletin contains the analyses of the samples collected in the open market by a representative of the Station.

The analyses of the manufacturer's samples for this year were published early in March. The present bulletin contains the analyses of the Station samples and of such of the manufacturer's samples as were received after Bulletin 50 was issued.

The figures which are given as the percentages of valuable ingredients guaranteed by the manufacturers are the minimum percentages of the guarantee. If, for instance, the guarantee is 2 to 3 per cent of nitrogen, it is evident that the dealer cannot be held to have agreed to furnish more than 2 per cent and so this percentage is taken as actual guarantee. The figures under the head of "found" are those showing the actual composition of the samples.

A comparison of the results of the analyses of the samples collected by the Station with the percentages guaranteed by the manufacturers shows, that, while as a rule the fertilizers sold in the State are up to guarantee, in some instances the particular lots of fertilizers sampled are not as good as they should be. The comparisons indicate that many of the manufacturers do not intend to do much more than make good the minimum guarantee and it is not surprising that this results in some of the goods falling below the guarantee in one or more ingredients. As this seems to be a growing tendency, it has been thought best to make a list of the brands which fall considerably below guarantee. The table which follows gives the names of the goods and the ingredients in which they are deficient. No brand is included in this list unless it falls short by at least one-tenth in one or more of its ingredients. While the number of brands which are considerably below their guarantee in one or more ingredients is quite large, there is little reason for thinking that there is any intention to defraud. It frequently happens that a fertilizer which is below in one ingredient is considerably above in others. While this frees the manufacturer from the suspicion of attempting to defraud, it is nevertheless a serious defect in a fertilizer. It is not enough that a fertilizer contains an equivalent amount of some other kind of plant food. When the purchaser pays for fifty pounds of nitrogen he is not rightly treated if the manufacturer gives him thirty pounds of nitrogen, even though he gives him enough more of potash or phosphoric acid to make a financial equivalent.

One of the claims which fertilizer manufacturers are making for the superiority of their goods over "home mixed fertilizers" is that the former are "manufactured." This should mean, if it means anything, that the goods are more evenly mixed and therefore more uniform. In the tables it will be found that in some instances in which two samples of the same brand have been taken and analyzed, that they differ from each other quite materially. The samples were taken with a great deal of care by experienced men from a large number of packages. It would not seem difficult to make "home mixed fertilizers" which should run as uniform as some of the brands here reported upon.

The goods made by the Provincial Chemical Fertilizer Company differ so greatly in composition from the guarantee that the only conclusion seems to be that the company does not know what it is doing. This is illustrated by comparing the guarantee and the analysis of their Imperial Superphosphate as follows:

	Guaranteed. %	Found. %
Nitrogen	2.51	.86
Available phosphoric acid	9.80	9.12
Total phosphoric acid	12.10	17.00
Potash	1.50	5.01

Notwithstanding the great discrepancies between guarantee and the actual composition of the goods offered, it has not been deemed best to report the case to the Secretary of Agriculture. Correspondence seems to indicate that while the Company has made great mistakes, that there was no intention to defraud. If they sell goods in Maine next year they will take pains to learn their composition before offering them.

A LIST OF FERTILIZERS SOLD IN MAINE IN 1899, THE OFFICIALLY COLLECTED SAMPLES OF WHICH CONTAINED LESS THAN NINE-TENTHS OF THE GUARANTEED AMOUNTS OF ONE OR MORE OF THE FERTILIZING CONSTITUENTS.

Kind of Fertilizer.	Deficient in.
Blanchard's Fish, Bone and Potash	Total phosphoric acid.
Stockbridge Seeding Down Manure	Total phosphoric acid.
Stockbridge Top Dressing Manure	Nitrogen.
Bradley's Eureka Fertilizer	Available phosphoric acid.
Bradley's X. L. Phosphate	Nitrogen.
Great Planet Manure	Nitrogen.
Cleveland Bone and Potash	Potash.
Darling's Animal Fertilizer "G" Brand	Potash.
*Darling's Blood, Bone and Potash	Nitrogen and potash.
Lister's Seeding Down Fertilizer	Potash.
Swift's Lowell Ground Bone	Nitrogen.
Otis Seeding Down Fertilizer	Nitrogen and total phosphoric acid.
Philbrick's Fertilizer	Available phosphoric acid.
Provincial Chemical Fertilizer Co.'s Imperial Superphosphate	Nitrogen.
Provincial Chemical Fertilizer Co's Special Potato Phosphate	Nitrogen.
*Quinnipiac Phosphate	Nitrogen.
Maine State Grange Potato Manure	Nitrogen.
Dirigo Fertilizer	Nitrogen and total phosphoric acid.

* A second sample drawn at another place while not up to the guarantee was better than this one.

LICENSED FERTILIZERS NOT FOUND IN THE STATE.

The following brands were licensed and probably sold in the State, but were not found by the inspector. The analysis of the manufacturers' samples of these goods is here reprinted from Bulletin 50 of this Station.

DESCRIPTIVE LIST OF MANUFACTURERS' SAMPLES, 1899.

Station number.	Manufacturer, place of business and brand.
	E. L. LEWIS, ATLANTIC, MASS.
2132	Lewis Potato Fertilizer
	RUSSIA CEMENT CO., GLOUCESTER, MASS.
1410	Essex Complete Manure for Corn, Grain and Grass
1411	Essex Complete Manure for Potatoes, Roots and Vegetables
2106	Essex Corn Fertilizer
2107	Maine State Grange Seeding Down Fertilizer
	STANDARD FERTILIZER CO., BOSTON, MASS.
1890	Standard Bone and Potash

ANALYSES OF MANUFACTURERS' SAMPLES, 1899.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	As ammonia, or nitrates.	As organic.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
2132	1.20	2.36	3.56	3.28	3.74	2.40	1.93	6.14	5.0	8.07	6.0	10.43	10.0
1410	......	......	4.00	3.70	3.02	6.39	2.51	9.41	7.0	11.92	9.5	10.52	9.5
1411	......	......	3.96	3.70	2.60	5.54	2.84	8.14	7.0	10.98	9.0	9.18	8.5
2106	.52	1.72	2.24	2.00	5.31	4.03	4.14	9.34	9.0	13.48	11.0	3.33	3.0
2107	......	1.91	1.91	1.50	3.19	4.24	6.36	7.43	7.0	13.79	13.0	5.69	5.5
1890	......	......	......	......	6.94	3.03	1.51	9.97	8.0	11.48	10.0	4.10	2.5

TRADE VALUATIONS.

In 1894 this Station stopped printing trade valuations. Although this was explained at the time, letters are occasionally received in which correspondents ask for trade valuations and our reasons for not publishing them. The reasons briefly stated are as follows:

The chief reason is that *commercial* values are not the same as *agricultural* values. Trade values are determined by market conditions, the agricultural value is measured by the increase of crop. Printing trade valuations increases the tendency, already far too strong, to purchase fertilizers on the *ton* basis without regard to the content or form of plant food. The agricultural value of a fertilizer depends upon the amount and form of nitrogen, phosphoric acid and potash it contains and the use to which it is to be put. The purchase of a fertilizer is really the purchase of one or more of these ingredients, and the thing of first importance is not the trade value of a ton, but the kinds and pounds of plant food contained in a ton.

In the selection of a fertilizer, the first question to be decided is, what use is to be made of it. Is it nitrogen, phosphoric acid or potash that is needed, or is it any two or all three that must be had? Is the fertilizer to supplement farm manures, to act as a "starter" for the crop or must it furnish all the plant food for the crop?

Having decided just what plant food is needed, it is now time to consult the fertilizer bulletin and see which of the brands there given has an analysis nearest to the required one. In this selection generally only high grade goods (those having high percentages of plant food) should be considered, as high grade goods cannot be made from inferior sources of plant food. Low grade can be made from high grade goods by the use of "fillers," but high grade goods cannot be made from other than high class materials. Freight costs no more on a ton of goods having 500 pounds of plant food than on a ton having only 200 pounds of plant food, nor is the cost of mixing a ton of high grade goods greater than the cost of mixing low grade goods.

The final step is to inquire prices and buy the kind which comes nearest to meeting the needs at the lowest price per ton. The cost, although of great importance, is to be considered *after* the kinds and amounts of plant food needed are decided upon.

That which transcends everything else in the purchase of fertilizers is to know *what* you want and then get it—get it as cheap as you can and still get the kind of plant food needed. No one would think of buying salt for sugar because it can be obtained at a lower price, but the writer has knowledge of the purchase of nitrogen when potash was needed, simply because the trade value of a nitrogenous fertilizer as printed exceeded its selling price. The fertilizer bulletin thus became misleading to the unthinking man, and largely on this account the printing of trade values was discontinued.

Descriptive List of Station Samples, 1899.

Station number.	Manufacturer, place of business, and brand.	Sampled at.
	HIRAM BLANCHARD, EASTPORT, ME.	
2154	Blanchard's Fish, Bone and Potash	Houlton
	BOWKER'S FERTILIZER CO., BOSTON, MASS.	
2155	Bowker's Bone and Wood Ash Fertilizer	Belfast
2156	Bowker's Corn Phosphate	Portland
2157	Bowker's Early Potato Manure	Caribou
2158	Bowker's Farm and Garden Phosphate	Portland
2159	Bowker's Fresh Ground Bone	Portland
2160	Bowker's High Grade Fertilizer	Bangor
2161	Bowker's Hill and Drill Phosphate	Portland
2162	Bowker's Lawn and Garden Dressing	Portland
2163	Bowker's Market Garden Manure	Bangor
2164	Bowker's Potash—Bone	Bangor
2165	Bowker's Potato and Vegetable Manure	Houlton
2166	Bowker's Potato and Vegetable Phosphate	Houlton
2167	Bowker's 6% Potato Fertilizer	Presque Isle
2168	Bowker's Special Fertilizers—Potato and Vegetables	Bangor
2169	Bowker's Square Brand Bone and Potash	Presque Isle
2170	Bowker's Staple Phosphate or 3% Fertilizer	Belfast
2171	Bowker's Superphosphate with Potash	Belfast
2172	Bowker's Sure Crop Phosphate	Portland
2173	Bowker's 10% Manure	Houlton
2174	Gloucester Fish and Potash	Belfast
2175	Stockbridge Corn and Grain Manure	Portland
2176	Stockbridge Pea and Bean Manure	Bangor
2177	Stockbridge Potato and Vegetable Manure	Houlton
2178	Stockbridge Seeding Down Manure	Bangor
2179	Stockbridge Strawberry Manure	Bangor
2180	Stockbridge Top Dressing Manure	Bangor
	BRADLEY FERTILIZER CO., BOSTON, MASS.	
2181	Bradley's Complete Manure for Potatoes and Vegetables	Houlton
2299	Bradley's Complete Manure for Potatoes and Vegetables	Portland
2182	Bradley's Corn Phosphate	Portland
2183	Bradley's English Lawn Fertilizer	Bangor
2184	Bradley's Eureka Fertilizer	Bangor
2185	Bradley's Potato Fertilizer	Portland
2186	Bradley's Potato Manure	Portland
2187	Bradley's X. L. Phosphate	Belfast
2300	Bradley's X. L. Phosphate	Portland
	CLARK'S COVE FERTILIZER CO., BOSTON, MASS.	
2188	Bay State Defiance Phosphate	Portland
2189	Bay State Fertilizer	Bangor
2190	Bay State Fertilizer for Seeding Down	Bangor
2191	Bay State Fertilizer, G. G	Bangor
2192	Great Planet Manure	Houlton
2301	Great Planet Manure	Bangor
2193	King Philip Alkaline Guano for Potatoes	Belfast
2194	Triumph Bone and Potash	Bangor

Analyses of Station Samples, 1899.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	As ammonia or nitrates.	As organic.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
2154	.74	1.97	2.71	2.50	......	1.86	2.02	1.86	2.00	3.88	4.50	5.33	4.50
2155	1.62	.01	1.63	1.50	......	7.16	3.83	7.16	6.00	10.99	8.00	2.45	2.00
2156	.84	.73	1.57	1.60	2.87	5.01	2.63	7.88	7.00	10.51	9.00	2.59	2.00
2157	1.90	1.26	3.16	3.00	4.67	2.71	1.86	7.38	7.00	9.24	9.00	8.16	7.00
2158	.68	.98	1.66	1.50	7.07	3.12	1.56	10.19	8.00	11.75	10.00	2.22	2.00
2159	.12	2.51	2.63	2.25	......	.....	......	......	......	22.67	18.00	......	.....
2160	1.38	1.11	2.49	2.25	5.69	2.81	2.58	8.50	8.00	11.08	10.00	4.65	4.00
2161	.86	1.47	2.33	2.25	7.42	2.64	1.30	10.06	9.00	11.36	12.00	2.41	2.00
2162	3.83	......	3.83	3.00	.....	7.12	1.90	7.12	6.00	9.02	8.00	5.14	5.00
2163	.88	1.86	2.74	2.25	4.21	2.04	2.03	6.25	6.00	8.28	8.00	10.69	10.00
2164	.70	.16	.86	.75	2.76	3.11	2.58	5.87	6.00	8.45	8.00	2.26	2.00
2165	1.36	1.02	2.38	2.25	5.45	2.96	2.91	8.41	9.00	11.32	11.00	4.12	4.00
2166	.88	.71	1.59	1.50	5.74	3.51	1.86	9.25	8.00	11.11	10.00	2.35	2.00
2167	.66	.33	.99	.75	5.28	3.08	2.26	8.36	7.00	10.62	10.00	6.37	6.00
2168	1.30	1.29	2.59	2.25	4.99	3.25	2.53	8.24	8.00	10.77	10.00	4.56	4.00
2169	.08	1.99	2.07	1.50	1.53	4.45	6.05	5.98	6.00	12.03	12.00	2.41	2.00
2170	.80	.23	1.03	.75	6.24	3.38	2.03	9.62	8.00	11.65	10.00	3.15	3.00
2171	.....	.....	......	.....	.75	8.87	3.46	9 62	10.00	13.08	11.00	2.16	2.00
2172	.49	.53	1.02	.75	6.14	3.61	2.44	9.75	8.00	12.19	10.00	2.30	1.00
2173	.58	.39	.97	.75	2.58	4.18	3.15	6.76	6.00	9.91	8.00	10.46	10.00
2174	.63	.25	.88	.75	5.50	4.23	3.57	9.73	6.00	13.30	9.00	1.49	1.00
2175	1.24	1.97	3.21	3.00	6.91	2.28	.85	9.19	8.00	10.04	10.00	7.28	6.00
2176	.78	2.07	2.85	2.00	3.96	2.26	2.03	6.22	6.00	8.25	8.00	9.96	6.00
2177	1.26	2.02	3.28	3.25	4.59	2.23	2.83	6.82	6.00	9.65	7 00	11.99	10.00
2178	.66	2.08	2.74	2.50	4.48	2.27	1.79	6.75	6.00	8.54	12.00	10.60	10.00
2179	1.36	1.30	2.66	2.25	5.61	4.19	3.33	9.80	6.00	13.13	7.00	4.94	4.00
2180	3.48	.75	4.23	5.00	4.99	2.67	1.42	7.66	4.00	9.08	6.00	7.10	6.00
2181	1.09	1.89	2.98	3.30	5.63	2.72	2.23	8.35	8.00	10.58	9.00	6.81	7.00
2299	1.38	1.71	3.09	3.30	4.16	4.32	1.88	8.48	8.00	10.36	9.00	6.32	7.00
2182	.12	2.07	2.19	2.05	6.49	2.99	2.37	9.48	9.00	11.85	10.00	2.19	1.50
2183	4.92	.01	4.93	4.95	4.61	4.45	1.42	6.06	5.00	7.48	6.00	3.20	2.50
2184	.10	1.83	1.93	1.03	3.33	2.15	5.05	5.48	8.00	10.53	9.00	2.16	2.00
2185	.24	2.34	2.58	2.06	5.44	3.58	2.63	9.02	9.00	11.65	11.00	3.57	3.25
2186	.82	1.70	2.52	2.50	6.59	.15	2.92	6.74	6.00	9.66	8.00	5.87	5.00
2187	1.04	1.28	2.32	2.50	6.94	2.91	1.99	9.85	9.00	11.84	11.00	2.35	2.00
2300	.44	1.79	2.23	2.50	5.87	3.76	2.77	9.63	9.00	12.40	11.00	2.40	2.00
2188	.18	.94	1.12	.82	2.42	5.93	3.19	8.35	7.00	11.54	9.00	1.20	1.00
2189	.90	1.72	2.62	2.47	6.75	2.87	2.07	9.62	9.00	11.69	10.00	1.90	2.00
2190	.06	1.07	1.13	1.03	5.92	2.46	1.93	8.38	8.00	10.31	10.00	2.61	2.00
2191	.14	2.13	2.27	1.85	5.81	3.25	2.28	9.06	8.50	11.34	10.00	2.24	2.00
2192	1.18	1.78	2.96	3.30	5.85	1.54	3.19	7.39	8.00	10.58	9.00	7.87	7.00
2301	.74	1.93	2.67	3.30	2.22	5.43	3.09	7.65	8.00	10.74	9.00	6.39	7.00
2193	.10	1.33	1.43	1.23	4.58	3.51	3.46	8.09	6.50	11.55	8.00	3.26	3.00
2194	......	.....	... ..	.....	8.96	1.16	2.28	10.12	10.00	12.40	11.00	2.05	2.00

Descriptive List of Station Samples, 1899.

Station number.	Manufacturer, Place of Business, and Brand.	Sampled at
	CLEVELAND DRYER CO., BOSTON, MASS.	
2298	Cleveland Bone and Potash	Bangor
2195	Cleveland Fertilizer for All Crops	Portland
2196	Cleveland Pioneer Fertilizer	Bangor
2197	Cleveland Potato Phosphate	Portland
2198	Cleveland Seeding Down Fertilizer	Portland
2199	Cleveland Superphosphate	Portland
	E. FRANK COE CO., NEW YORK, N. Y.	
2200	E. Frank Coe's Bay State Phosphate	Belfast
2201	E. Frank Coe's Columbian Special Corn Fertilizer	Bangor
2202	E. Frank Coe's Columbian Special Potato Fertilizer	Portland
2203	E. Frank Coe's Excelsior Potato Fertilizer	Belfast
2204	E. Frank Coe's Grass and Grain Fertilizer	Portland
2205	E. Frank Coe's High Grade Ammoniated Bone Phosphate	Belfast
2206	E. Frank Coe's High Grade Potato Fertilizer	Belfast
2207	E. Frank Coe's New Englander Potato Fertilizer	Bangor
3208	E. Frank Coe's Prize Brand Grain and Grass Fertilizer	Portland
2209	E. Frank Coe's Special Potato Fertilizer	Bangor
2210	E. Frank Coe's Standard Grade Ammoniated Bone Phosphate	Portland
	CROCKER CHEM. & FERT. CO., BUFFALO, N. Y.	
2211	Crocker's Ammoniated Corn Phosphate	Bangor
2313	Crocker's Ammoniated Corn Phosphate	Bangor
2212	Crocker's New Rival Superphosphate	Bangor
2314	Crocker's New Rival Superphosphate	Bangor
2213	Crocker's Potato, Hop and Tobacco Phosphate	Bangor
2315	Crocker's Potato, Hop and Tobacco Phosphate	Bangor
2214	Crocker's Superior Fertilizer	Bangor
2316	Crocker's Superior Fertilizer	Bangor
2215	Crocker's Superior Rye and Oats Fertilizer	Bangor
	CUMBERLAND BONE PHOS. CO., PORTLAND, ME.	
2216	Cumberland Hawkeye Fertilizer	Bangor
2217	Cumberland Potato Fertilizer	Belfast
2218	Cumberland Seeding Down Manure	Bangor
2219	Cumberland Superphosphate	Bangor
	L. B. DARLING FERT. CO., PAWTUCKET, R. I.	
2220	Darling's Animal Anchor Brand	Augusta
2221	Darling's Animal Fertilizer "G" Brand	Augusta
2222	Darling's Blood, Bone and Potash	Houlton
2302	Darling's Blood, Bone and Potash	Augusta
	F. S. FARRAR & CO., BANGOR, ME.	
2223	Farrar's Potato Manure	Bangor
2224	Farrar's Superphosphate	Bangor
	GREAT EASTERN FERTILIZER CO., RUTLAND, VT.	
2225	Great Eastern Dissolved Bone	Portland
2226	Great Eastern Gen. Fertilizer	Portland
2227	Great Eastern Grass and Oats Fertilizer	Portland
2228	Great Eastern Northern Corn Special	Bangor
2229	Great Eastern Potato Manure	Bangor
	LISTER'S AGRICUL. CHEM. WORKS, NEWARK, N.J.	
2230	Lister's Seeding Down Fertilizer	Banger
2231	Lister's Special Potato Fertilizer	Bangor
2232	Lister's Success Fertilizer	Bangor
2233	Lister's "U. S." Superphosphate	Bangor

ANALYSES OF STATION SAMPLES, 1899.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	As ammonia or nitrates.	As organic.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
2298	.....	.....	.....	.....	6.62	3.50	2.63	10.12	8.00	12.75	10.00	2.21	2.50
2195	.14	1.22	1.36	1.03	7.42	.75	1.70	8.17	8.00	9.87	9.00	2.10	2.00
2196	.18	1.08	1.26	.82	3.94	4.58	2.59	8.52	7.00	11.11	9.00	1.33	1.00
2197	1.02	1.24	2.26	2.05	3.24	5.29	2.39	8.53	8.00	10.92	10.00	2.86	3.00
2198	.08	2.00	2.08	1.03	5.61	4.19	1.53	9.80	8.00	11.33	9.00	2.32	2.00
2199	.20	1.94	2.14	2.05	5.26	3.56	2.79	8.82	9.00	11.61	11.00	2.51	2.00
2200	.24	1.61	1.85	2.00	6.86	2.34	2.32	9.20	9.00	11.52	11.00	3.30	1.85
2201	.20	1.30	1.50	1.23	6.86	2.99	2.68	9.85	8.50	12.53	10.50	3.03	2.50
2202	.24	1.09	1.33	1.20	5.68	3.27	2.93	8.95	8.50	11.88	10.00	*2.91	2.50
2203	.62	2.07	2.69	2.50	6.62	1.63	2.22	8.25	8.00	10.47	8.00	*8.09	8.00
2204	.20	.84	1.04	.80	6.62	3.34	1.59	9.96	8.50	11.55	10.00	2.28	1.50
2205	.18	1.96	2.14	1.85	6.86	2.61	2.19	9.47	9.00	11.66	11.00	2.66	2.25
2206	1.20	1.54	2.74	2.40	6.19	2.20	2.17	8.39	7.00	10.56	8.00	*6.35	6.50
2207	.08	.99	1.07	.80	4.75	3.65	3.29	8.40	7.00	11.69	9.00	3.38	3.00
2208	.....	.....	.....	.....	7.18	3.47	2.12	10.65	10.50	12.77	12.00	2.26	2.00
2209	.30	1.64	1.94	1.65	7.34	1.84	3.38	9.18	8.00	12.56	10.00	*4.21	4.00
2210	.22	1.27	1.49	1.20	7.03	2.88	2.42	9.91	8.50	12.33	10.00	2.45	2.25
2211	.10	2.22	2.32	2.05	6.33	3.54	1.47	9.87	10.00	11.34	11.00	1.74	1.62
2313	.04	2.12	2.16	2.05	6.62	3.05	2.17	9.67	10.00	11.84	11.00	1.76	1.62
2212	.10	1.40	1.50	1.23	5.50	4.08	2.33	9.63	10.00	11.96	11.00	1.75	1.62
2314	.04	1.36	1.40	1.23	6.94	2.08	2.64	9.02	10.00	11.66	11.00	1.73	1.62
2213	.08	2.12	2.20	2.05	5.95	3.77	1.84	9.72	10.00	11.56	11.00	3.32	3.24
2315	.42	1.80	2.22	2.05	6.65	3.01	1.63	9.66	10.00	11.29	11.00	3.26	3.24
2214	.04	1.06	1.10	.82	3.94	3.69	1.95	7.63	8.00	9.59	9.00	2.03	2.00
2316	.08	.92	1.00	.82	5.02	3.36	1.79	8.38	8.00	10.17	9.00	2.59	2.00
2215	.08	.92	1.00	.82	5.12	4.07	1.28	9.19	8.00	10.47	9.00	2.81	2.00
2216	.10	1.18	1.28	.82	5.31	3.41	1.93	8.72	7.00	10.65	9.00	1.43	1.00
2217	.87	1.19	2.06	2.06	5.95	3.05	1.16	9.00	9.00	10.16	11.00	2.90	3.00
2218	.06	1.14	1.20	1.03	5.93	2.74	1.80	8.67	8.00	10.47	10.00	2.43	2.00
2219	.89	1.17	2.06	2.06	6.01	2.88	2.12	8.89	8.00	11.01	10.00	2.63	2.00
2220	.16	2.05	2.21	1.65	7.10	2.32	.79	9.42	6.00	10.21	7.00	2.10	2.00
2221	.16	2.23	2.39	2.06	7.23	2.02	.75	9.25	6.00	10.00	7.00	3.51	4.00
2222	1.27	2.32	3.59	4.12	5.17	3.88	.68	9.05	7.00	9.73	8.00	6.72	7.50
2302	.90	2.70	3.60	4.12	5.69	2.88	.74	8.57	7.00	9.31	8.00	7.73	7.50
2223	.....	.....	3.60	2.25	1.50	7.80	6.91	9.30	9.00	16.21	12.00	2.76	3.00
2224	.....	.....	3.46	2.50	1.44	7.86	6.93	9.30	9.00	16.23	12.00	2.70	2.00
2225	.....	.....	.....	.....	11.16	3.60	.36	14.76	14.00	15.12	....	.....	.....
2226	.06	.88	.94	.82	5.92	3.41	1.54	9.33	8.00	10.87	.....	5.11	4.00
2227	.....	.....	.....	.....	7.40	4.21	2.09	11.61	11.00	13.70	.....	1.80	2.00
2228	.16	2.93	3.09	2.88	.77	6.54	3.85	7.31	8.00	11.16	.....	2.64	2.00
2229	.14	2.21	2.35	2.06	1.23	7.04	2.68	8.27	8.00	10.95	.....	4.57	4.00
2230	.14	.80	.94	.62	7.18	3.25	2.19	10.43	10.00	12.62	11.00	1.49	1.92
2231	.22	1.51	1.73	1.65	5.18	2.74	3.00	7.92	8.00	10.92	9.00	3.51	3.00
2232	.24	1.27	1.51	1.24	6.78	2.73	2.54	9.51	9.50	12.05	11.50	2.24	2.00
2233	.20	1.29	1.49	1.32	3.16	3.86	2.74	7.02	7.00	9.76	8.00	2.77	2.00

* Largely sulphate.

Descriptive List of Station Samples, 1899.

Station number.	Manufacturer, place of business, and brand.	Sampled at.
	LOWELL FERTILIZER CO., BOSTON, MASS.	
2234	Swift's Lowell Animal Fertilizer	Bangor
2235	Swift's Lowell Bone Fertilizer	Bangor
2236	Swift's Lowell Dissolved Bone and Potash	Bangor
2237	Swift's Lowell Ground Bone	Bangor
2238	Swift's Lowell Potato Phosphate	Bangor
	NATIONAL FERTILIZER CO., BRIDGEPORT, CONN.	
2239	Chittenden's Ammoniated Bone Fertilizer	Presque Isle
2240	Chittenden's Complete Root Fertilizer	Caribou
2241	Chittenden's Market Garden Fertilizer	Fort Fairfield
	SAMUEL G. OTIS, HALLOWELL, ME.	
2242	Otis Potato Fertilizer	Hallowell
2243	Otis Seeding Down Fertilizer	So. Windham
2244	Otis Superphosphate	So. Windham
	PACIFIC GUANO CO., BOSTON, MASS.	
2245	Pacific Guano Co.'s Dissolved Bone and Potash	Bangor
2246	Pacific Guano Co.'s Grass and Grain Fertilizer	Portland
2247	Pacific Guano Co.'s Potato Special	Belfast
2248	Nobsque Guano	Bangor
2249	Soluble Pacific Guano	Bangor
2303	Soluble Pacific Guano	Portland
	PACKER'S UNION FERT. CO., NEW YORK, N. Y.	
2250	Packer's Union Animal Corn Fertilizer	Portland
2251	Packer's Union High Grade Potato Manure	Blaine
2252	Packer's Union Universal Fertilizer	Blaine
2253	Packer's Union Wheat, Oats and Potato Fertilizer	Blaine
	PARMENTER & POLSEY FER. CO., PEABODY, MASS.	
2254	"A. A." Brand	Presque Isle
2255	Plymouth Rock Brand	Presque Isle
2256	"P. and P." Potato Fertilizer	Presque Isle
2257	Parmenter & Polsey Special Potato Fertilizer	Presque Isle
2258	Star Brand Superphosphates	Presque Isle
	EDWIN J. PHILBRICK, AUGUSTA, ME.	
2259	Philbrick's Fertilizer	Augusta
	PORTLAND RENDERING CO., PORTLAND, ME.	
2260	Portland Rendering Co.'s Bone Tankage	East Deering
	PROVINCIAL CHEM. FERT. CO., L'T'D, ST. JOHN, N. B., CANADA.	
2261	Imperial Superphosphate	Presque Isle
2262	Provincial Chemical Fert. Co.'s Special Potato Phosphate	Presque Isle
	THE QUINNIPIAC CO., BOSTON, MASS.	
2263	Quinnipiac Climax Phosphate	Bangor
2264	Quinnipiac Corn Manure	Portland
2265	Quinnipiac Phosphate	Portland
2304	Quinnipiac Phosphate	Belfast
2266	Quinnipiac Potato Manure	Bangor
2305	Quinnipiac Potato Manure	Portland
2267	Quinnipiac Potato Phosphate	Bangor
2306	Quinnipiac Potato Phosphate	Portland
2268	Quinnipiac Seeding Down Manure	Portland
	READ FERTILIZER CO., NEW YORK, N. Y.	
2269	Read's Potato Manure	Bucksport
2307	Read's Potato Manure	Portland
2270	Read's Practical Potato Special	Bucksport
2271	Read's Standard Superphosphate	Bucksport
2272	Read's Sure Catch Fertilizer	Portland
2273	Read's Vegetable and Vine Fertilizer	Bucksport
2274	Sampson Fertilizer	Bucksport

Analyses of Station Samples, 1899.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	As ammonia or nitrate.	As organic.	Total. Found.	Total. Guaranteed.	Soluble.	Reverted.	Insoluble.	Available. Found.	Available. Guaranteed.	Total. Found.	Total. Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
2234	.06	2.56	2.62	2.46	7.66	1.59	1.48	9.25	9.00	10.73	10.00	4.59	4.00
2235	.10	1.66	1.76	1.64	4.23	3.31	2.04	7.54	8.00	9.58	9.00	4.13	3.00
2236	.12	1.84	1.96	1.64	6.01	2.92	2.18	8.83	9.00	11.01	10.00	2.35	2.00
2237	.08	2.00	2.08	2.46	......	......	......	....	5.00	28.94	28.00	......	.....
2238	.14	2.42	2.56	2.46	5.26	2.54	1.56	7.80	8.00	9.36	9.00	*6.51	6.00
2239	.12	1.92	2.04	1.60	3.40	6.31	2.14	9.71	9.00	11.86	10.00	2.35	2.00
2240	.18	3.34	3.52	3.30	5.42	2.72	3.04	8.14	8.00	11.18	10.00	6.27	6.00
2241	.48	2.08	2.56	2.40	5.63	2.10	2.95	7.73	7.00	10.68	9.00	7.00	6.00
2242	.16	2.17	2.33	2.00	5.14	4.02	2.58	9.16	9.00	11.74	11.00	3.52	3.00
2243	.12	1.14	1.26	1.50	5.34	4.00	1.39	9.34	8.00	10.73	12.00	1.89	2.00
2244	.22	1.90	2.12	2.00	6.22	3.67	2.31	9.89	9.50	12.20	11.00	2.27	2.00
2245	... .	.....	.....	......	6.14	4.93	2.65	11.07	10.00	13.72	11.00	2.07	2.00
2246	.12	1.12	1.24	.82	4.74	2.70	2.42	7.44	7.00	9.86	8.00	1.83	1.08
2247	.14	1.97	2.11	2.05	6.06	4.34	1.57	10.40	8.00	11.97	9.00	3.25	3.00
2248	.18	1.10	1.28	1.15	5.10	3.79	1.71	8.89	8.00	10.60	9.00	2.49	2.00
2249	.08	2.02	2.10	2.25	6.25	3.24	2.11	9.49	8.50	11.60	10.50	2.17	2.00
2303	.08	2.14	2.22	2.25	3.94	4.66	2.48	8.60	8.50	11.08	10.50	2.66	2.00
2250	.22	2.46	2.68	2.47	3.35	6.18	2.09	9.53	8.00	11.62	9.00	2.23	2.00
2251	.22	2.02	2.24	2.06	1.07	6.98	1.94	8.05	8.00	9.99	9.00	6.20	6.00
2252	.36	.78	1.14	.82	4.63	4.58	3.56	9.21	8.00	12.77	9.00	5.40	5.00
2253	......	......	......	......	7.10	5.56	2.79	12.66	11.00	15.45	......	2.48	2.00
2254	3.00	1.21	4.21	4.53	3.56	4.59	1.19	8.15	7.00	9.34	8.00	9.46	8.00
2255	1.38	1.29	2.67	2.47	5.12	4.82	1.62	9.94	8.00	11.56	9.00	5.02	4.00
2256	1.40	.86	2.26	1.64	2.66	4.34	1.33	7.00	6.00	8.33	7.00	7.03	5.50
2257	2.04	1.23	3.27	3.29	4.63	3.94	1.16	8.57	8.00	9.73	9.00	8.30	7.00
2258	.04	1.74	1.78	1.64	3.37	4.43	1.85	7.80	7.00	9.65	8.00	3.26	2.50
2259	1.40	.64	2.04	2.00	2.52	3.72	4.02	6.24	7.00	10.26	9.00	6.72	5.00
2260	......	......	4.54	4.42	......	6.14	10.51	6.14	......	16.65	18.59	......	......
2261	.10	.76	.86	2.51	7.18	1.94	7.88	9.12	9.80	17.00	12.10	5.01	1.50
2262	.16	.76	.92	3.08	7.00	2.50	7.22	9.50	10.11	16.72	12.28	6.43	6.02
2263	.12	1.04	1.16	1.03	4.98	3.88	1.45	8.86	8.00	10.31	9.00	2.64	2.00
2264	.12	2.09	2.21	2.06	5.42	3.86	2.48	9.28	9.00	11.76	10.00	2.39	1.50
2265	1.06	1.34	2.40	2.47	4.00	5.38	1.75	9.38	9.00	11.13	10.00	1.97	2.00
2304	.10	2.00	2.10	2.47	5.63	3.02	1.51	8.65	9.00	10.16	10.00	2.79	2.00
2266	1.70	.66	2.36	2.47	4.88	2.66	.89	7.54	6.00	8.43	7.00	4.55	5.00
2305	.70	1.57	2.27	2.47	4.45	3.97	1.34	8.42	6.00	9.76	7.00	4.65	5.00
2267	1.76	.23	1.99	2.05	2.03	6.61	2.51	8.64	8.00	11.18	9.00	3.02	3.00
2306	.54	1.69	2.23	2.05	3.01	5.51	2.64	8.52	8.00	11.16	9.00	3.00	3.00
2268	.12	1.12	1.24	.82	4.42	5.29	1.61	9.71	9.00	11.32	10.00	2.39	2.00
2269	.12	2.20	2.32	2.47	4.53	3.46	2.68	7.99	7.00	10.67	8.00	10.75	10.00
2307	.94	1.42	2.36	2.47	6.59	2.24	.79	8.83	7.00	9.62	8.00	*10.00	10.00
2270	.04	.99	1.03	.82	2.11	2.31	1.26	4.42	4.00	5.68	5.00	9.13	8.00
2271	.10	1.00	1.10	.82	5.09	3.00	1.16	8.09	8.00	9.25	9.00	4.40	4.00
2272	......	......	.....	......	1.79	4.33	.91	6.12	6.00	7.03	7.00	3.62	4.00
2273	.04	1.71	1.75	1.65	4.43	2.46	.93	6.89	6.00	7.82	7.00	8.96	8.00
2274	.10	1.68	1.78	1.65	4.31	2.31	.91	6.62	6.00	7.53	7.00	4.52	4.00

* Largely sulphate.

Descriptive List of Station Samples, 1899.

Station number.	Manufacturer, Place of Business, and Brand.	Sampled at
	RUSSIA CEMENT CO., GLOUCESTER, MASS.	
2275	Essex Potato Fertilizer	Presque Isle
2276	Essex XXX Fish and Potash	Presque Isle
2277	Maine State Grange Chemicals	Houlton
2278	Maine State Grange Potato Manure	Houlton
	SAGADAHOC FERT. CO., BOWDOINHAM, ME.	
2279	Dirigo Fertilizer	Cumberland
2280	Merrymeeting Superphosphate	Brewer
2281	Sagadahoc Bone Meal	Bowdoinham
2282	Sagadahoc Special Potato Fertilizer	Brewer
2308	Sagadahoc Special Potato Fertilizer	Cumberland
2283	Sagadahoc Superphosphate	Cumberland
2284	Yankee Fertilizer	Brewer
	STANDARD FERTILIZER CO., BOSTON, MASS.	
2285	Standard A Brand	Portland
2297	Standard Bone and Potash	Garland
2286	Standard Fertilizer	Bangor
2287	Standard Guano	Portland
2288	Standard Special for Potatoes	Bangor
2309	Standard Special for Potatoes	Portland
	HENRY F. TUCKER CO., BOSTON, MASS.	
2289	Tucker's Original Bay State Bone Superphosphate	Portland
	JOHN WATSON, HOULTON, ME.	
2136	Watson's Potato Manure	Houlton
	WILLIAMS & CLARK FERT. CO., BOSTON, MASS.	
2290	Americus Ammoniated Bone Superphosphate	Portland
2291	Americus Corn Phosphate	Portland
2310	Americus Corn Phosphate	Bangor
2292	Americus Potato Manure	Bangor
2311	Americus Potato Manure	Portland
2293	Prolific Crop Producer	Belfast
2294	Royal Bone Phosphate for All Crops	Bangor
2295	Williams & Clark's Potato Phosphate	Portland
	A. F. YOUNG AND CO., NEW YORK, N. Y.	
2296	Young's Excelsior Potato Fertilizer	Presque Isle

Analyses of Station Samples, 1899.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	As ammonia or nitrates.	As organic.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
2275	.98	1.02	2.00	2.00	3.83	7.53	3.85	11.36	9.00	15.21	11.00	6.29	5.00
2276	.08	2.46	2.54	2.10	4.59	6.07	5.10	10.66	9.00	15.76	12.00	2.46	2.25
2277	1.64	.89	2.53	2.50	4.86	3.83	4.39	8.69	8.00	13.08	12.00	4.31	4.00
2278	.70	.32	1.02	1.50	3.51	7.33	2.49	10.84	9.00	13.33	12.00	12.47	12.00
2279	.08	1.38	1.46	2.00	1.99	3.30	2.76	5.29	3.00	8.05	10.00	5.53	4.00
2280	.30	1.34	1.64	1.50	3.11	2.95	2.23	6.06	5.00	8.29	9.00	3.14	2.00
2281	.18	4.33	4.51	3.00	......	......	......	......	......	18.09	20.00	......	......
2282	1.56	.60	2.16	2.40	5.26	3.43	1.03	8.69	6.00	9.72	10.00	*8.67	7.00
2308	1.48	.90	2.38	2.40	5.49	3.01	.84	8.50	6.00	9.34	10.00	*8.65	7.00
2283	1.36	.67	2.03	2.10	5.58	3.28	1.35	8.86	6.00	10.21	10.00	6.12	4.00
2284	.14	.92	1.06	.50	2.36	3.75	1.25	6.11	3.00	7.36	7.00	4.39	1.50
2285	.14	1.06	1.20	.82	3.38	5.22	2.67	8.60	7.00	11.27	9.00	1.18	1.00
2297	......	.....	......	.....	6.08	4.17	1.77	10.25	8.00	12.02	10.00	2.39	2.50
2286	.76	1.45	2.21	2.00	6.09	4.00	1.84	10.09	8.00	11.93	10.00	2.22	2.00
2287	.82	.70	1.52	1.25	7.23	2.33	2.58	9.56	6.50	12.14	8.50	3.28	3.00
2288	1.02	.94	1.96	2.05	2.47	5.76	2.51	8.23	8.00	10.74	9.00	3.20	3.00
2309	.56	1.74	2.30	2.05	2.55	6.02	2.63	8.57	8.00	11.20	9.00	2.83	3.00
2289	.12	2.13	2.25	2.06	5.53	3.95	1.56	9.48	9.00	11.04	11.00	2.24	2.00
2136	.16	2.39	2.55	2.50	2.49	3.56	.84	6.05	6.00	6.89	7.00	5.00	5.00
2290	.92	1.42	2.34	2.47	6.27	4.02	2.16	10.29	9.00	12.45	10.00	2.36	2.00
2291	.12	2.23	2.35	2.06	5.15	3.74	2.70	8.89	9.00	11.59	10.00	2.29	1.50
2310	.10	2.13	2.23	2.06	5.01	3.83	3.00	8.84	9.00	11.84	10 00	1.98	1.50
2292	1.02	.99	2.01	2.06	2.55	6.11	2.50	8.66	8.00	11.16	9.00	2.84	3.00
2311	.38	1.78	2.16	2.06	2.44	6.78	2.19	9.22	8.00	11.41	9.00	2.99	3.00
2293	.10	1.12	1.22	.82	6.27	3.15	2.03	9.42	6.00	11.45	7.00	1.51	1.00
2294	.14	1.02	1.16	1.03	5.10	4.10	1.49	9.20	7.00	10.69	8.00	2.30	2.00
2295	1.00	1.48	2.48	2.47	3.54	4.09	1.63	7.63	6.00	9.26	7.00	5.14	5.00
2296	1.86	.88	2.74	2.88	3.68	2.81	.60	6.49	5.50	7.09	......	10.33	10.00

* Largely sulphate.

Descriptive List of Manufacturers' Samples, 1899.*

Station No.	Manufacturer, place of business, and brand.
	BOWKER FERTILIZER CO., BOSTON, ASS.
2145	Bowker's Early Potato Manure
2146	Bowker's Lawn and Garden Dressing
2147	Bowker's Potash—Bone
2148	Bowker's Potato and Vegetable Manure
	BRADLEY FERTILIZER CO., BOSTON, MASS.
2137	Bradley's English Lawn Fertilizer
	CLARK'S COVE FERTILIZER CO., BOSTON, MASS.
2138	Great Planet Manure
2139	Triumph Bone and Potash
	CLEVELAND DRYER CO., BOSTON, MASS.
2140	Cleveland Bone and Potash
	E. FRANK COE CO., NEW YORK, N. Y.
2141	E. Frank Coe's New Englander Potato Fertilizer
	PARMENTER & POLSEY FERTILIZER CO., PEABODY, MASS.
2142	"A. A." Brand
	PROVINCIAL CHEMICAL FERTILIZER CO., L'T'D, ST. JOHN, N. B.
2135	Imperial Superphosphate
2134	Special Potato Phosphate
	READ FERTILIZER CO., SYRACUSE, N. Y.
2143	Read's Potato Manure
	WILLIAMS & CLARK FERTILIZER CO., BOSTON, MASS.
2144	Prolific Crop Producer

Analyses of Manufacturers' Samples, 1899.*

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	As ammonia or nitrates.	As organic.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
2145	1.06	1.94	3.00	3.00	5.14	2.67	1.99	7.81	7.00	9.80	9.00	7.72	7.00
2146	3.64	.17	3.81	3.00	5.02	1.84	1.89	6.86	6.00	8.75	8.00	5.81	5.00
2147	.87	......	.87	.75	1.83	5.41	2.65	7.24	6.00	9.89	8.00	2.36	2.00
2148	.90	1.35	2.25	2.25	5.69	4.25	1.42	9.94	9.00	11.36	11.00	4.36	4.00
2137	5.60	.....	5.60	4.95	4.83	3.36	.70	8.19	5.00	8.89	6.00	3.63	2.50
2138	1.34	1.96	3.30	3.30	6.65	2.75	.79	9.40	8.00	10.19	9.00	7.03	7.00
2139	......	......	.....	.....	7.77	3.60	.97	11.37	10.00	12.34	11.00	2.98	2.00
2140	......	......		......	8.12	4.26	1.16	12.38	8.00	13.54	10.00	3.23	2.50
2141	.20	.95	1.15	.80	7.77	2.98	1.96	10.75	7.00	12.71	9.00	*3.46	3.00
2142	3.38	.81	4.19	4.53	3.38	4.41	.83	7.79	7.00	8.62	8.00	10.69	8.00
2135	....	......	.68	2.51	7.59	1.57	7.84	9.16	9.87	17.00	12.10	4.91	1.50
2134	......	.....	.81	3.08	7.81	1.31	7.85	9.13	10.11	16.98	12.28	5.15	6.02
2143	.08	2.71	2.79	2.47	5.66	2.28	1.21	7.94	7.00	9.15	8.00	9.08	10.00
2144	.10	.97	1.07	.82	5.20	3.23	1.38	8.43	6.00	9.81	7.00	1.49	1.00

*These goods were licensed after the March Bulletin was issued.

NUTS AS FOOD.

CHAS. D. WOODS and L. H. MERRILL.

While the use of nuts in this country has already attained considerable proportions, it is believed that a careful study of their food qualities would lead to their largely increased consumption. In view of their high nutritive value and the readiness and cheapness with which they may be produced, it is a matter of some astonishment that they have received so little consideration as a food and that so little attention has been devoted to their culture. This neglect is explained in part by the abundance and cheapness of cereal products, which supply our wants so fully that we have not been forced to seek foods from unusual and less reliable sources. Although, within certain limits, grain production varies from year to year, we have few more certain crops. On the other hand, the production of nuts, like that of the apple and tree fruits in general, is subject to greater fluctuations which are far less under the immediate control of man.

It is impossible to estimate with any degree of accuracy the amount of nuts consumed in this country. The following table, furnished by the statistician of the U. S. Department of Agriculture, shows only our imports. The consumption of home grown nuts must exceed these figures many fold.

IMPORTS OF NUTS INTO THE UNITED STATES.

	Twelve Months Ending June					
	1897.		1898.		1899.	
	Pounds.	Values.	Pounds.	Values.	Pounds.	Values.
Almonds	9,644,338	$880,263	5,746,362	$659,659	9,957,427	$1,222,587
Cocoanuts	....	471,387	....	575,935	....	625,789
All other nuts	....	848,511	....	1,002,344	....	879,166

The vast range of climatic conditions to be found in this country will enable us to grow nearly all the nuts which we now import. Some progress has already been made along these lines. Our native nuts should be improved. Nuts are subject to as many and great varietal changes as apples and are doubtless as susceptible of improvement.

THE CHEMICAL COMPOSITION OF NUTS.

It is believed that with the larger supply, the improved quality and the lower prices that would in time follow an increased demand, our American dietaries would make an important gain at a small cost. It is with a view of calling more general attention to this subject that the analyses given on the following pages are presented. Those analyses to which the fuel value is added were made at this Station. The others were compiled from various sources, as indicated in the foot-notes.

Almond. (Amygdalus communis).

Of the almonds consumed in the United States, by far the larger part is supplied by France, Italy and Spain. Repeated attempts have been made to grow the almond in this country, but nearly all have resulted in failure. California, however, seems to offer a promising field for this culture, and the crop of that state for 1891 was estimated at 1,000,000 pounds. As the imports for the same year amounted to about 7½ million pounds, valued at nearly $1,000,000 it may be safely predicted that our production will be largely increased.

Below is given the average of the analyses of eleven varieties of California almonds, and also four analyses of European almonds.

COMPOSITION OF THE ALMOND.

	Refuse.	Water.	Protein.	Fat.	Total carbo-hydrates.	Ash.
Edible portion:						
California almonds *a*	....	4.8	21.0	54.9	17.3	2.0
European almonds *b*	....	6.0	23.5	53.0	14.4	3.1
As purchased:						
California almonds	*c*64.8	1.7	7.3	19.3	6.2	.7

a. California Experiment Station Report, 1895-96; 1896-97, p. 151.
b. Koenig: Nahrungs-und Genusmittel, I, p. 608.
c. As the proportion of shell to kernel for the dry nut was not given, we have used here the proportion found in nuts purchased in the Maine market.

Brazil Nut. (*Bertholletia excelsa*).

As its name indicates, this nut is a native of Brazil, whence large quantities are exported. In 1897 our imports were valued at $234,972. The nut has not been successfully grown in the United States.

COMPOSITION OF THE BRAZIL NUT.

	Laboratory number.	Refuse.	Water.	Protein.	Fats.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
Edible portion	6167	....	5.3	17.0	66.8	7.0	3.9	3,329
As purchased........	6167	49.6	2.7	8.6	33.6	3.5	2.0	1,678

Filbert. (*Corylus*).

The European hazels or filberts which supply our markets are crosses and varieties of two species, *C. avellana* and *C. tubulosa.* The filbert is only sparingly grown in the United States. Our native hazels are smaller than the European nuts, though some varieties have been noted which are well worthy of cultivation.

The filbert finds its chief use as a dessert nut. In some European countries where it is produced in large quantities it is ground to a flour and used for bread. Along the Black Sea shore of Asiatic Turkey the culture of the filbert has attained great importance, the production about Trebizond in 1896 being estimated at 38,518,771 pounds.

COMPOSITION OF THE FILBERT.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
Edible portion......	6170	....	3 7	15.6	65.3	13.0	2.4	3,432
As purchased.........	6170	52.1	1.8	7.5	31.3	6.2	1.1	1,644
Edible portion *a*......	......	....	7.1	17.4	62.6	10.4	2.5	

a. Koenig: Nahr. u. Genusmittel, II, p. 500. The average of two analyses.

Hickory-nut.

The hickory-nut best known to our market is the fruit of the shag-bark hickory, *Hicoria ovata* Britton. Like the other hickories, it is a native of America. It has a wide range, being found from southern Maine, west to Minnesota, and south to Texas and Florida. It is said to reach its best development west of the Alleghanies.

The quality of the nut is exceedingly variable, both as to the flavor of the kernel and the readiness with which the shell can be removed. The better varieties are highly esteemed and by many are considered the best of our American nuts, for delicacy of flavor comparing not unfavorably with the English walnut. The price is as variable as the quality, ranging, at the place and time of harvest, from 20 cents to $3.00 per bushel.

COMPOSITION OF THE HICKORY-NUT.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
Edible portion	6171	....	3.7	15.4	67.4	11.4	2.1	3,495
As purchased	6171	62.2	1.4	5.8	25.5	4.3	.8	1,321

Pecan. (Hicoria pecan).

The pecan is also a native of America, but is far less widely distributed than the species last described (*Hicoria ovata*), being found from Indiana to Iowa on the north to Tennessee and Texas on the south. It thrives best in the rich, moist soils along the river banks. Although some of the largest and best pecans are grown in Louisiana, a large proportion of those placed upon the market are from Texas, where its culture has attained considerable importance.

The flavor of the pecan makes it a desirable nut, but it owes much of its popularity to the thinness of its shell and the consequent ease with which it may be removed. These qualities adapt it especially to dessert purposes. Large quantities of this nut are used by confectioners, the shelled meats in halves selling at 30 to 40 cents per pound.

COMPOSITION OF THE PECAN.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
Pecans, polished:								
Edible portion	6174	....	3.0	11.0	71.2	13.3	1.5	3,633
As purchased......	6174	53.2	1.4	5.2	33.3	6.2	.7	1,700
Pecans, unpolished:								
Edible portion	6173	....	2.7	9.6	70.5	15.3	1.9	3,566
As purchased......	6173	46.3	1.5	5.1	37.9	8.2	1.0	1,915

English Walnut. (*Juglans regia*).

In the United States the walnut has been successfully cultivated in the Central and Southern Atlantic States, in California, and Oregon. In California the culture is especially successful, the product for 1898 being estimated at eight million pounds.

COMPOSITION OF THE WALNUT.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, det.
California soft shell, J. regia, 4 analyses *a*.								
Edible portion..............	......	.....	2.5	16.6	63.4	16.1	1.4	
As purchased......................	.....	58.1	1.0	7.0	26.6	6.7	.6	
California bijou, J. regia *a*.								
Edible portion	......	.....	2.5	18.4	64.4	13.0	1.7	
As purchased....................	.....	73.1	.7	4.9	17.3	3.5	.5	
Italian, J. regia.								
Edible portion	6212	......	4.0	16.9	68.0	9.0	2.1	3,538
As purchased.....................	6212	57.8	1.7	7.1	28.7	3.8	.9	1,493
Juglans regia, 4 analyses *b*.								
Edible portion.......	......	......	7.2	15.8	57.4	17.6	2.0	
California native black, J. California *a*.								
Edible portion...................	.....	......	2.5	24.9	54.7	16.1	1.8	
As purchased....................	......	74.1	.6	6.4	14.2	4.2	.5	
California grown American black, J. nigra *a*.								
Edible portion....................	......	.....	2.5	30.3	57.8	7.4	2.0	

a. Calif. Expt. Station, Bulletin 113, p. 12.
b. Koenig. Nahr. u. Genusmittel, II, p. 500.

Although Asiatic in its origin, this is commonly spoken of as the English walnut. Owing to its general excellence it early won its way to popular favor, having been distributed through nearly all Europe, reaching England as early as the middle of the sixteenth century.

Chestnut. (*Castanea dentata*).

The American chestnut has a wide geographical range, being found in nearly every state east of the Mississippi, from southern Maine to the Gulf. It seems to thrive best on high lands, with light and even sandy soils. Both the European and Japanese chestnuts are also cultivated here to some extent; neither of them yield nuts of as good quality as our native stock, though both excel our nut in size.* The price of the native nut varies from $1 to $10 per bushel, according to locality, abundance and excellence of the nut.

In France, where the chestnut is widely grown, the nut has come to play an important part in the dietaries of the poor. The common way of preparing the nuts is to remove the shells and steam them, when they may be eaten either with salt or milk, furnishing a cheap and nutritious food. Thus prepared, the hot nuts are sold in the streets, and form the chief morning dish for a large proportion of the working classes. Large quantities of the nuts are also dried and ground to a flour, which can be kept for some time without deteriorating. This flour, mixed with water and baked in thin sheets, forms a heavy, but sweet and nutritious cake. The use of the chestnut is not confined to the poor, since it is used in many forms by the well-to-do classes who prepare from them many palatable side dishes.

In Italy the use of the chestnut is also very general. The nut is eaten fresh, boiled and roasted, or as a substitute for corn meal in the "polenta," a form of porridge much used by the poorer classes. A common delicacy in the Apennines is "necci," flat cakes of chestnut flour and water, baked between hot, flat stones, with chestnut leaves between the cakes.† In Korea the chestnut is said almost to take the place which the potato occupies with us, being used raw, boiled, roasted, cooked with meat, or dried whole.

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* Nut culture in the United States, U. S. Department of Agriculture, p. 82.

† Knight: Food and Its Functions, p. 199.

The chestnut differs widely from the other common nuts, since it contains much less oil and protein and much more of the carbohydrates, especially starch, which is almost wholly wanting in many nuts. It is thus a far less concentrated and better balanced food than our other nuts. The high prices which prevail in our Maine markets will prevent its very general adoption. A large and steady demand would in time lead to an increased production and ultimately to lower prices.

COMPOSITION OF THE CHESTNUT.

Variety and condition.	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.
Edible portion:							
Numbo, fresh *a*	......	......	42.2	6.1	6.6	43.3	1.8
Moon's Seedling, fresh *a*	......	....	41.7	6.3	6.4	43.8	1.8
Solebury, fresh *a*	......	....	29.2	6.7	8.3	54.0	1.8
Native, fresh *a*	......	....	34.4	8.0	10.8	45.1	1.7
Italian, fresh *b*	......	....	53.8	6.6	2.0	36.9	.7
Italian, fresh *b*	......	....	52.7	4.1	2.0	40.4	.8
Variety unknown, fresh *c*	......	....	44.9	7.3	8.0	38.3	1.5
Average, fresh nuts	.....	....	42.7	6.5	6.3	43.1	1.4
Spanish, dry *a*	.....	....	6.6	9.0	6.6	75.0	2.8
Paragon, dry *a*	......	....	6.5	11.4	9.1	70.1	2.9
Spanish, dry *a*	.....	....	5.4	10.3	9.1	72.5	2.7
Native, dry *a*	.....	....	4.8	11.6	15.3	65.7	2.6
Average, dry nuts	......	....	5.8	10.6	10.0	70.8	2.8
As purchased:							
Numbo, fresh *a*	......	11.5	37.3	5.4	5.9	38.3	1.6
Moon's Seedling, fresh *a*	.....	14.3	35.7	5.4	5.5	37.5	1.6
Solebury, fresh *a*	......	15.3	24.8	5.7	7.0	45.7	1.5
Native, fresh *a*	......	23.2	26.4	6.2	8.3	34.6	1.3
Italian, fresh *b*	......	15.4	45.5	5.6	1.7	31.2	.6
Italian, fresh *b*	.....	15.5	44.5	3.5	1.7	34.1	.7
Average, fresh nuts	.....	15.9	35.7	5.3	5.0	36.9	1.2
Spanish, dry *a*	......	21.5	5.2	7.0	5.2	58.9	2.2
Paragon, dry *a*	......	23.9	5.0	8.7	6.9	53.3	2.2
Spanish, dry *a*	......	25.3	4.0	7.7	6.8	54.2	2.0
Native, dry *a*	......	22.9	3.7	8.9	11.8	50.7	2.0
Average, dry nuts	......	23.4	4.5	8.1	7.7	54.2	2.1

a Penn. Expt. Station, Bulletin 16, p. 15.
b Calif. Expt. Station, Report 1895-6; 1896-7, p. 153, Bulletin 113, p. 7.
c Mass. State Expt. Station, Report, 1893, p. 354.

Peanut. (*Arachis hypogœa*).

The peanut, although not a nut in the botanical sense, is for convenience here included. It is extensively grown in at least four continents—Asia, Africa, North and South America—and has been so long and so widely cultivated that some doubt exists with regard to its origin. It is now generally regarded as a native of Brazil, although even in that country it is unknown in its wild form. Prior to 1865 the United States imported large quantities of peanuts from Western Africa. Since that date the home production has enormously increased until at the present time our crop is estimated at 4,000,000 bushels, about one-seventh of the crop of the world. Of this amount Virginia, North Carolina and Tennessee produce by far the larger part. The culture is not as profitable as formerly, since, through injudicious methods of cultivation, the previous yield of 50 or more bushels per acre has fallen to less than one-half that amount, while the cost of cultivation remains practically the same.*

There is but little waste in peanut production. The dried vines are used as hay, while the pods and low grades of the nuts are also fed to stock. Probably three-fourths of the peanuts themselves are retailed in the roasted form. A part of the cheaper grades is used by confectioners. In Europe, and to a much more limited extent in this country, the oil is extracted. This oil, forming from one-third to one-half of the kernel, is clear, sweet and palatable, for many purposes fully equal to the more costly olive oil. Indeed, much that is sold as olive oil is either peanut oil, or contains a large admixture of the same. The high grades are used in Germany as a salad oil; while the lower grades find ready use as lubricants or are employed in soap making. Although the American peanut is larger and more palatable than the African, the latter furnishes a better oil.

As a food for man, the peanut has a high claim upon the popular favor. There seems to be no reason why it should not be considered as a regular article of diet and be placed in some form upon our tables. If the cake remaining after the extraction of peanut oil be ground to a fine powder, it furnishes a flour from which a nutritious bread can be made. Attempts made in Germany to utilize this flour in the preparation of army bread have not been altogether successful, but the matter is worthy of farther trial.

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*Farmers Bulletin, No. 25.

COMPOSITION OF THE PEANUT.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Total value per pound, determined.
Edible portion:								
Georgia peanut *a*	......	......	12.9	26.6	37.6	21.0	1.9	
Spanish peanut *a*	.....	......	13.2	27.9	35.8	20.7	2.4	
Variety unknown *b*	......	......	4.9	29.1	48.8	15.3	1.9	
Variety unknown	6213	.....	6.0	28.1	45.7	17.8	2.4	3,008
Varieties unknown, 8 anal. *c*	.....	......	6.9	27.7	45.8	17.0	2.6	
Average, 12 analyses	.....	.....	7.7	27.8	44.5	17.6	2.4	
Roasted peanut	6214	.....	1.6	30.5	49.2	16.2	2.5	3,177
As purchased:								
Georgia peanut *a*	.....	27.0	9.4	19.4	27.5	15.3	1.4	
Spanish peanut	..	22.0	10.3	21.8	27.9	16.1	1.9	
Variety unknown *b*	......	28.8	3.5	20.7	34.7	10.9	1.4	
Variety unknown	6213	28.0	4.3	20.3	32.9	12.8	1.7	2,166
Average 4 analyses	......	26.4	6.9	20.6	30.7	13.8	1.6	
Roasted peanuts	6214	32.6	1.1	20.6	33.1	10.9	1.7	2,141
Peanut butter *d*	.....	....	2.1	28.7	46.4	18.8	*f* 4.0	
Peanut butter *e*	......	....	2.0	29.9	46.7	15.4	*g* 6.0	

a. Georgia Expt. Station, Bulletin 13, p. 64.
b. North Carolina Expt. Station, Bulletin 90 B, p. 10.
c. Koenig: Nahr. u. Genussmittel, II, p. 500.
d. From the Atlantic Peanut Refinery, Philadelphia.
e. From the Peanolina Company, New Haven.
f. Including salt 3.2 per cent.
g. Including salt 5.0 per cent.

Acorns. (*Quercus*).

The only analysis here given is of the fruit of the common black oak of the desert regions of Arizona (Q. *Emoryi*). The acorns of this species are generally known as "biotes." With this analysis is given that of a sample of acorn meal and a bread prepared from the same. Acorns in the natural state are unfit for human food on account of the large amount of tannin which they contain. The meal and bread here reported were prepared by the Indians of California who by some means succeed in removing the tannin. While the meal was found to contain 6.63 per cent tannin, only a trace was discoverable in the bread. Both meal and bread were sour and sodden when received.

The Indians of the Yosemite Valley make a porridge by stirring up acorn meal with water. This is cooked by dropping in heated stones. The cooked porridge thickens on cooling, when it is sliced and browned before the fire.

COMPOSITION OF ACORNS (QUERCUS EMORYI), ACORN MEAL, AND ACORN BREAD.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Food value per pound, determined.
Acorn, edible portion	6193	....	4.1	8.1	37.4	48.0	2.4	2,718
Acorn as received ...	6193	35.6	2.6	5.2	24.1	30.9	1.6	1,750
Acorn meal...........	6184	....	8.7	5.7	18.6	65.0	2.0	2,265
Acorn bread	6185	....	60.3	2.2	9.9	27.0	.6	2,347

Beechnut. (Fagus Americana).

The beech is a common forest tree over the eastern half of the United States. The nuts are sweet and among the best of our wild nuts. They are widely gathered by children; but owing to the fact that the tree is an irregular bearer, the nuts small and prime favorites with the squirrels, only a very limited amount of this nut reaches the market. The prices are as variable as the supply, ranging from 10 to 60 cents per quart.

COMPOSITION OF THE BEECHNUTS.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
Fagus Americana:								
Edible portion......	6166	....	4.0	21.9	57.4	13.2	3.5	3,263
As purchased	6166	40.8	2.3	13.0	34.0	7.8	2.1	1,932
Fagus sylvestris *a*....								
Edible portion......	....	....	9.1	21.7	42.4	22.9	3.9	
As purchased	....	33.0	6.1	14.5	28.4	15.4	2.6	

a. Koenig: Nahr. u. Genusmittel, II, p. 500.

Butternut, Oil-nut, White Walnut. (*Juglans cinerea*).

The butternut is found over a large part of the eastern, middle and northern states, though it is most abundant and reaches its highest development in the Ohio River basin. Usually it is not a forest tree, but occurs most frequently in isolated positions and along fences. It is very prolific, single trees sometimes yielding 15 or 20 bushels.

Although a common nut in this State, it is not often found in the Maine markets. In the West it is more frequently met, the price ranging from 20 cents to $2 per bushel. When green the nuts are sometimes used for pickling. The thick dense shell of the ripened nut, its extreme oiliness with a tendency to become rancid, make this one of the least desirable of our nuts.

COMPOSITION OF THE BUTTERNUT.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
Edible portion	6168	....	4.5	27.9	61.2	3.4	3.0	3,371
As purchased........	6168	86.4	.6	3.8	8.3	.5	.4	458

Cocoanut. (*Cocos nucifera*).

Although large quantities of these nuts are annually imported into the United States, the home product is now considerable. During the past 20 years large numbers of trees have been planted in southern Florida, where it is estimated that there are at least 250,000 trees, over ten per cent of which are in bearing. The products of the cocoanut palm are so many and varied and find such ready application, that it may be long before our home production will satisfy the growing demand.

"The small, green and immature nuts are grated fine for medicinal use, and when mixed with the oil of the ripe nut it becomes a healing ointment. The jelly which lines the shell of the more mature nut, furnishes a delicate and nutritious food. The milk in its center, when iced, is a most delicious luxury. Grated cocoanut forms a part of the world renowned East India condiment, curry. Dried, shredded (desiccated) cocoanut is an important article of commerce.

"From the oil a butter is made, of a clear, whitish color, so rich in fat, that of water and foreign substances combined there are but .0068. It is better adapted for cooking than for table use. At present it is chiefly used in hospitals, but it is rapidly finding its way to the tables of the poor, particularly as a substitute for oleomargarine." *

COMPOSITION OF THE COCOANUT.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
Edible portion	6169	....	14.1	5.7	50.6	27.9	1.7	2,986
As purchased	6169	*a*48.8	7.2	2.9	25.9	14.3	.9	1,529
Without milk, as purchased	6169	*b*37.3	8.9	3.6	31.7	17.5	1.0	1,872
Cocoanut milk, as purchased	....	......	92.7	.4	1.5	4.6	.8	97
Shredded cocoanut *c*	....	....	4.3	6.5	63.7	24.1	1.4	
Shredded cocoanut *d*	....	....	2.8	6.0	51.0	39.0	1.2	
Edible portion *e*	....	....	5.8	8.9	67.0	16.5	1.8	
Cocoanut milk *f*	....	....	91.5	.5	.1	6.8	1.2	

a Milk and shell. *b* Shell only. *c* Storrs Expt. Station. *d* New Jersey Expt Station. *e* Koenig, Nahr. u. Genusmittel, II, 500. *f* Ibid, I, 495.

The meat of the cocoanut is poor in protein, as compared with most of the nuts here reported, and the milk contains about one-tenth the protein and less than one-half the fat found in the milk of the cow.

The Litchi, Leechee, or Chinese Nut. (*Nephelium litchi*).

This fruit is a native of China. It is not a true nut, although commercially classed as such. The imports to this country are quite small, and the consumption for the most part confined to the Chinese population. As the analysis indicates, it differs widely from true nuts, being very low in protein and fats and correspondingly high in carbohydrates. It finds its way to our markets only in the dried form. When fresh it is said to be one of the finest of Chinese fruits, having a white flesh with the taste of the best grapes.†

* Nut Culture in the United States, p. 98-99.
†Popular Science Monthly, XXVIII, p. 574.

COMPOSITION OF THE LITCHI NUT.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
Edible portion	6172	....	17.9	2.9	.2	77.5	1.5	1,453
As purchased	6172	41.6	10.5	1.7	.1	45.2	.9	849

Pine Nuts. (Pinus).

The seeds of three species of pine have been analyzed, *Pinus edulis* Engel., *P. monophylla* Torr. and Frem., and *P. Sabiniana* Doug.

COMPOSITION OF PINE NUTS.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
Pignolias, edible portion *a*	......	......	6.4	33.9	49.4	6.9	3.4	
Pinon, (P. monophylla):								
Edible portion	6211	......	3.8	6.5	60.7	26.2	2.8	3,327
As purchased	6211	41.7	2.2	3.8	35.4	15.3	1.6	1,940
Pinon, (Pinus edulis):								
Edible portion	6177	......	3.4	14.6	61.9	17.3	2.8	3,364
As purchased	6177	40.6	2.0	8.7	36.8	10.2	1.7	1,988
Pinon, (P. sabiniana):								
Edible portion	6192	.....	5.1	28.1	53.7	8.4	4.7	3,161
As purchased	6192	77.0	1.2	6.5	12.3	1.9	1.1	727

"The several species of pine yielding edible nuts are found on the Pacific Slope of the United States and in Colorado, New Mexico, Arizona and Mexico. The nuts are but little known to a majority of the people of the United States, though they are marketed in large quantities in some of the cities of California.

a From Bulletin 28 of the office of Experiment Station.

Some of them are of good size for dessert or confectionery purposes, and in quality and flavor are so superior that their general introduction will doubtless make them very popular.—Along the borders of Mexico the nuts are called "piñons," and to an increasing extent this name is being accepted as applicable to all pine nuts. The pine nut has a rich, marrowy kernel in a shell that varies in thickness from that of a chestnut to that of a hard-shelled hazel nut." *

Pistachio. (*Pistacia vera*).

This nut, although a native of Syria, has long been cultivated in Southern Europe, where it produces a fruit somewhat larger than that of the parent stock, but of a less desirable flavor. Most of the nuts used in the United States are from European countries bordering upon the Mediterranean. The pistachio was introduced into the Southern States nearly half a century ago and has been somewhat widely though not extensively grown. Small quantities of this nut have been successfully grown in California.

The kernel is greenish in color and has a somewhat mild but pleasing and characteristic flavor, suggestive of almonds. In this country it finds its largest use in the manufacture of confectionery, for which purpose it is valued both for its flavor and color.

COMPOSITION OF THE PISTACHIO.

	Laboratory number.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Fuel value per pound, determined.
First quality, edible portion..	6175	....	4.2	22.3	54.0	16.3	3.2	3,235
Second quality, edible portion	6176	....	4.3	22.8	54.9	14.9	3.0	3,262
Average.	....	....	4.2	22.6	54.5	15.6	3.1	3,249

* Nut Culture in the United States, p. 92.

DISCUSSION OF RESULTS.

It has been found that the nutritive value of all foods, irrespective of their source or kind, depends upon the presence of one or more of four classes of nutrients. These are called protein (nitrogenous matter), fats, carbohydrates and ash (mineral matter). The gluten of wheat, the lean of meat, the white of an egg and the curd of milk (casein), are all familiar illustrations of protein. These matters differ from other food constituents in that they contain nitrogen. Examples of fats are butter (fat of milk), the fat of meat, the oils of plants and seeds, as olive oil, oil of corn, etc. Carbohydrates consist of starch, sugar and allied substances. They make up the greater portion of such foods as potatoes and corn. Ash is the matter left after burning, and so far as nutrition is concerned, consists chiefly of phosphates and chlorides of lime, potash and soda.

Food has in general two distinct uses in the body: one to build up and repair, the other to supply the energy needed to enable the body to do work, maintain its temperature, etc. The living tissues of the body, with the exception of fatty tissues, are built up entirely from protein and ash. Protein can be used by the body as a source of energy, but the fats and carbohydrates are the chief sources of energy under normal conditions. The body cannot create energy, but is dependent upon the potential energy of its food for the work it does. The food yields up its energy to the body by being burned, just as truly as if it were in a furnace under a boiler.

As above stated, protein can be burned by the body as a source of energy. This, however, is wasteful of protein, as energy is much more economically furnished by fats and carbohydrates. Not only are the fats and carbohydrates burned as a source of energy, but being thus oxidized in the body they partially protect the protein of the food and of the body from being burned.

Since the chief use of protein is to build up and repair the animal body, if it were protected so that none of it were oxidized only a small amount of protein would be needed per day for maintenance of the body. As it is, even with an abundance of fats and carbohydrates in the food, quite considerable amounts of protein are daily oxidized. The amount of protein that is consumed in the body increases to some extent with the amount of external work done. From observation in the respiration calorimeter in feeding experiments and in dietary studies, Atwater estimates that a man at medium work uses daily about 4½ ounces of protein (.28 pounds or 125 grams).

The energy of the body is derived from the potential energy of its food, which can conveniently be measured by its fuel value. The calorie is the unit and is the amount of heat necessary to raise one kilogram of water 1° of the centigrade scale. This is very nearly the same as the amount of heat required to raise 4 pounds of water 1° Fahrenheit. The fuel value of foods can be very accurately determined by means of an apparatus termed the calorimeter. For example, the fuel value of a pound of shelled almonds, as given in the table on page 87, is 3,030 calories. This means that if a pound of this substance were burned, the heat given off would be capable of warming four times that number or 12,120 pounds of water 1° F.

The protein, fats and carbohydrates of the food are burned in the body and their value for this purpose can be best expressed in calories. A person remaining quiet in a temperature near that of the body would theoretically only use sufficient energy to perform necessary vital processes, such as digestion and assimilation of food, circulation of the blood, etc. If the temperature of the air is much below that of the body, more nutrients would need to be burned in order to keep the body warm, and if at the same time, exercise were taken or work of any kind done, added potential energy of the food would be needed to perform this. Atwater estimates that a man at medium work uses daily about 3,500 calories of potential energy which must be supplied by the food. The .28 of a pound of protein in the daily ration would furnish about 500 calories of energy; the remaining 3,000 calories must be furnished in the food in the form of fats and carbohydrates.

The food for a day's ration for a man at medium work should, therefore, supply about .28 pounds of protein and 3,500 calories of energy, or at the rate of 125 calories for each .01 pound of protein. The above facts and estimates make it easier to understand the nutritive value of different food materials and will help in discussing the place of nuts as food.

In the following table there is given the condensed results of the analyses of nuts given on pages 72 to 84 of this bulletin:

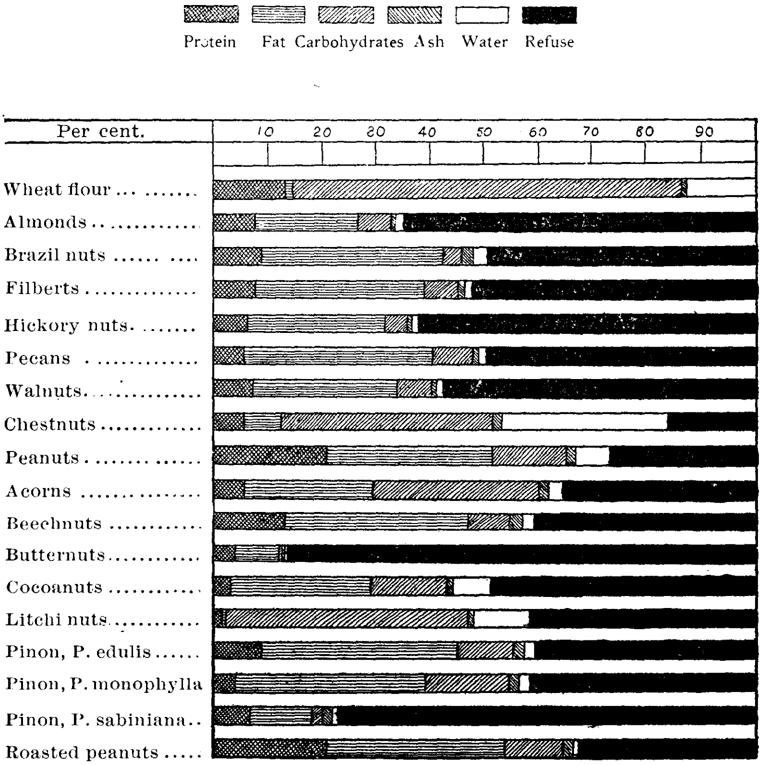
AVERAGE COMPOSITION OF NUTS.

	Number of analyses.	Refuse.	Edible portion.	Edible Portion. Water	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel value per pound.*
		%	%	%	%	%	%	%	Calories.
Almonds	1	64.8	35.2	1.7	7.3	19.3	6.2	.7	1065
Almonds, kernels	1	.....	100.0	4.8	21.0	54.9	17.3	2.0	3030
Brazil nuts	1	49.6	50.4	2.7	8.6	33.6	3.5	2.0	1545
Filberts	1	52.1	47.9	1.8	7.5	31.3	6.2	1.1	1575
Filberts, kernels	1	.....	100.0	3.7	15.6	65.3	13.0	2.4	3290
Hickory-nuts	1	62.2	37.8	1.4	5.8	25.5	4.3	.8	1265
Pecans	2	49.7	50.3	1.5	5.2	35.6	7.2	.8	1735
Pecans, kernels	2	.....	100.0	2.9	10.3	70.8	14.3	1.7	3445
Walnuts	5	58.0	42.0	1.2	7.0	27.0	6.1	.7	1385
Walnuts, kernels	5	.....	100.0	2.8	16.7	64.4	14.8	1.3	3305
Chestnuts	4	16.1	83.9	31.0	5.7	6.7	39.0	1.5	1115
Acorns	1	35.6	64.4	2.6	5.2	24.1	30.9	1.6	1690
Beechnuts	1	40.8	59.2	2.3	13.0	34.0	7.8	2.1	1820
Butternuts	1	86.4	13.6	.6	3.8	8.3	.5	.4	430
Cocoanuts	1	48.8	51.2	7.2	2.9	25.9	14.3	.9	1415
Cocoanuts, shredded	2	......	.....	3.5	6.3	57.3	31.6	1.3	3125
Litchi nuts	1	41.6	58.4	10.5	1.7	.1	45.2	.9	875
Pinon, P. edulis	1	40.6	59.4	2.0	8.7	36.8	10.2	1.7	1905
Pinon, P. monophylla	1	41.7	58.3	2.2	3.8	35.4	15.3	1.6	1850
Pinon, P. sabiniana	1	77.0	23.0	1.2	6.5	12.3	1.9	1.1	675
Pistachio, kernels	2	......	100.0	4.2	22.6	54.5	15.6	3.1	3010
Peanuts, raw	4	26.4	73.6	6.9	20.6	30.7	13.8	1.6	1935
Peanuts, kernels	4	.....	100.0	9.3	27.9	42.0	18.7	2.1	2640
Roasted peanuts	1	32.6	67.4	1 1	20.6	33.1	10.9	1.7	1985
Shelled peanuts	1	......	100.0	1.6	30.5	49.2	16.2	2.5	2955
Peanut butter	2	......	......	2.0	29.3	46.6	17.1	†5.0	2830

*Calculated from analysis. † Including salt, 4.1%.

In the following diagram the composition of the more important of the nuts is shown, compared with the nutrients of a good quality bread flour.

AVERAGE COMPOSITION OF NUTS AS PURCHASED, COMPARED WITH WHEAT FLOUR.



The first six nuts of the table and diagram are common dessert nuts and resemble each other in many respects. As these are found in the market, from 50 to 65 per cent of the unshelled nuts is refuse (shell). Only 35 per cent of the common almond, 40 per cent of the English walnut and about 50 per cent of the filbert, Brazil nut and pecan is edible. All of these six nuts as purchased contain but little water. The protein in the unshelled nuts runs from 5.2 per cent in the pecan, to 8.6 in the Brazil nut, and in the shelled nuts from 10.3 per cent of protein in the pecan, to 21 per cent in the almond. The fats (oils) form the largest part of the edible portion of these nuts varying from 19.3 per cent in unshelled almonds to 35.6 per cent in pecans. The fat in shelled almonds is 55 per cent and in filbert and walnut meats about 65 per cent and in pecans it makes up 70 per cent of the whole. The carbohydrates, which usually predominate in vegetable foods, occur in only small amounts. A pound of mixed nuts would contain about the following amounts of nutrients and potential energy.

APPROXIMATE COMPOSITION OF ONE POUND OF SIX COMMON NUTS.

	Refuse.	Protein.	Fats.	Carbo-hydrates.	Fuel value.
	Pounds.	Pounds.	Pounds.	Pounds.	Calories.
As purchased	.56	.07	.28	.06	1520
Edible portion	....	.16	.64	.13	324

A pound of good wheat flour contains about .13 pounds protein, .013 pounds of fat, and .72 pounds of carbohydrates, and has a fuel value of 1,600 calories. The meat of the nuts contains nearly fifty times as much fat, less than one-fifth as much carbohydrates, and has double the fuel value. A pound of unshelled nuts would furnish about half as much protein and about the same amount of potential energy as a pound of flour. The potential energy of the nuts is largely from the fats and that of the flour from carbohydrates. For each .01 pound of protein, flour has 123 calories of potential energy or in nearly the same proportions as that demanded by Atwater's standard for a man at medium work. The nuts have 202 calories for each .01 pound of protein and would not make a well balanced food when eaten by themselves. This unsuitableness for a food by themselves is also increased by the potential energy being stored in the concentrated form of fat. This is no reason, however, why nuts should not fill an increasingly large place in dietaries. Very few foods supply the needed nutrients in the proper proportion to form a well balanced ration. Foods rich in fuel constituents need to be combined with other foods of relatively high protein content. The low per cent of carbohydrates in nuts would seem to fit them as one of the sources of food for diebetic and other persons who find it needful to avoid foods containing much starch or sugar.

The chestnut differs materially from the six nuts we have just considered. While the protein content of the unshelled nut is not very unlike the ordinary table nut, it contains only one-fourth as much fat and six or seven times as much carbohydrates. Indeed its high starch content explains why chestnuts are so little eaten raw. Boiling or roasting causes the starch granules to swell and burst, rendering the nut of easier mastication and giving the digestive juices better opportunity to act upon the ingested nuts. A pound of unshelled chestnuts contains .057 pounds of protein and has a fuel value of 1,115 calories or 195 calories for each .01 pound of protein. This is a somewhat more nearly balanced food than the other nuts. As it yields itself readily to cookery, the chestnut should have a more prominent place in American dietaries.

Although the peanut is not a nut strictly speaking, it deserves special attention because of its composition. A pound of roasted peanuts in the shell has .206 pounds of protein, and a fuel value of 1,985 calories, and a pound of roasted and shelled peanuts carries .305 pounds of protein with a fuel value of 2,955 calories. Peanut butter is apparently ground peanuts and has practically the same composition as roasted and shelled peanuts. Peanuts have a fuel value of only 96 calories for each .01 pound of protein and hence have a relative excess of protein. This is so unlike other vegetable foods, with the exception of the near relatives of the peanut, as peas and beans, that it is of great importance. A bushel of raw peanuts weighs about 22 pounds and costs from 75 cents to $1.25. The roasted peanuts retail at from 5 to 10 cents a quart. A quart of peanuts contains as much protein as one pound of rump steak although, at usual prices, the later costs three times as much.

In this country nuts will never to any great extent replace the cereal foods, as is the case in some sections of the Old World. Not only would the original cost prevent, but the labor involved in shelling and preparing nuts for the table would prove a serious obstacle to their extended use. It will, however, be interesting to compare the relative cost of the different nutrients as furnished by different nuts and by wheat flour at the prices which fairly represent the cost in Maine cities.

AMOUNTS OF NUTRIENTS FURNISHED FOR 10 CENTS IN NUTS AT ORDINARY PRICES.

Nuts as purchased.	Prices per pound.	Ten Cents will Pay for—					
		Weight of kernel.	Nutrients.				Fuel value calculated.
			Total.	Protein.	Fats.	Carbo-hydrates.	
	Cents.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Calories.
Almonds	15	.23	.21	.05	.12	.04	675
Brazil nuts	12	.42	.38	.07	.28	.03	1370
Filberts	15	.32	.30	.05	.21	.04	1055
Hickory-nuts *a*	9	.42	.40	.07	.28	.05	1405
Pecans	15	.33	.32	.04	.23	.05	1140
Walnuts	15	.28	.27	.05	.18	.04	925
Chestnuts *b*	8.4	1.00	.62	.07	.08	.47	1340
Peanuts *c*	7.3	1.01	.89	.28	.42	.19	2645
Peanuts *d*	14.6	.50	.44	.14	.21	.09	1320
Wheat flour	3.0	....	2.88	.43	.04	2.41	5450

a At 10 cents per quart, 488 grams.
b At 5 cents per quart, 270 grams.
c At 5 cents per quart, 22 pounds per bushel.
d At 10 cents per quart.

DIGESTIBILITY.

There are no reliable data regarding the digestibility of nuts. The belief in their indigestibility seems to be widespread and perhaps has some basis in fact. It is quite probable that if the nuts were properly prepared and eaten at proper times, much of this prejudice would disappear. Our present practice of munching them at odd hours, or as a dessert, when sufficient food has been taken to meet the requirements of the body, overtaxes the digestive organs and places the nut under a reproach that is at least in part undeserved.

Preparation and Use of Nut Foods.

This subject can be treated here in only a very general way. The first difficulty to be encountered is the removal of the shell. With the peanut this is easily accomplished. With many of our nuts, however, the shell is so hard and tough as to discourage the use of large quantities. Some varieties are shelled by machine and the kernels are placed upon the market.

Chestnuts and peanuts when properly prepared furnish palatable and nutritious soups. Peanuts and walnuts, if passed through a meat chopper, or otherwise reduced to a fine state of division, make a butter-like paste which may be used in the preparation of sandwiches. A German dish consists of chestnuts baked with raisins. Salads, croquettes and stuffing for roast fowl may be agreeably diversified by the use of nuts. Commercial preparations of "peanut butter" are on the market and are well received. Desiccated cocoanut is an important article of food. With the exception of the peanut, chestnut and almond, most of the nuts are eaten raw. The nuts, particularly the peanut and chestnut afford interesting opportunities for the housewife skilled in adding to the list of "good things." Attention has been called to the fact that nuts form a very concentrated food. They should, therefore, be eaten with coarser foods and, except in the case of the peanut, with those richer in protein.

CEREAL BREAKFAST FOODS.

CHAS. D. WOODS and L. H. MERRILL.

The general use, at the present time, of cereals on the breakfast table is largely due to the improved condition in which these goods are now offered. Twenty years ago uncooked decorticated oats, (sold under the name of oat meal), graham flour, corn meal, and hominy, all of which required long cooking, made up nearly the entire list of breakfast cereals available to the average housekeeper. Today it is possible to purchase at a moderate price cereal foods which have been previously thoroughly cooked, and subsequently dried so that they will keep indefinitely. These are ready for the table without further cooking or, if wanted hot, can be prepared in a few minutes' time. The process of manufacture is hygienic and cleanly and will bear the closest inspection. Starting from the elevator the goods are cleaned, milled, cooked, evaporated, and packed by machinery. It is very gratifying to find that this class of goods is free from adulteration and careless preparation. The processes differ in different factories and many of them are covered by patents. Some goods may be better prepared than others, just as one flour is better than another; but there is no preparation on the market so far as the writers know, but what is better prepared than anything known to the generation which preceded us.

The tables on pages 94 and 95 contain the description of the samples, including name of goods, name of the maker, place of purchase, the price paid, the weight of the package contents, and the cost per pound. The goods were, with one exception, purchased in Bangor the same day. It was found that the prices at different stores were practically the same for the same goods.

The table on page 96 gives the analyses of these foods calculated to dry matter. The determinations were made by the usual methods, and the heats of combustion were determined by means of the Atwater bomb calorimeter. The fuel value is here given per gram.

The table on page 97 gives the results of the table on page 96 calculated to water content at time of the purchase of the materials. Fuel values as here given are calculated per pound instead of per gram as in the preceding table.

CEREAL FOODS.

Laboratory number.	Name.	Manufacturer.
	CORN PREPARATIONS.	
6230	Crown Flakes	Crown Cereal Company
6231	Hecker's Hominy	Hecker, Jones-Jewell Milling Co.
6232	H-O Company's New Process Hominy	The H-O Company
6233	Mazama	Mazama Health Food Company
	UNCOOKED OAT MEALS.	
6234	A Oat Meal	American Cereal Company
6235	C Oat Meal	American Cereal Company
6245	McCann's Finest Oat Meal	John McCann
	COOKED OAT PREPARATIONS.	
6242	Hecker's Oat Meal	
6244	Hornby's H-O Oat Meal	The H-O Company
6236	American Cereal Company's Rolled Oats	American Cereal Company
6237	American Cereal Company's Rolled Oats	American Cereal Company
6338	Buckeye Rolled Oats	American Cereal Company
6239	Buckeye Rolled Oats	American Cereal Company
6241	Echo White Rolled Oats	Steward & Merriam
6243	Hecker's Rolled White Oats	Hecker, Jones-Jewell Milling Co.
6240	Peoria Rolled Oats	Steward & Merriam
6246	Quaker Rolled White Oats	American Cereal Company
6247	Tip Top Rolled Oats	Akron Cereal Company
	WHEAT PREPARATIONS.	
6264	Fruen's Best Wheat Wafers	Fruen Cereal Company
6263	Fruen's Rolled Wheat	Fruen Cereal Company
6254	H-O Company's Breakfast Food	The H-O Company
6256	Old Grist Mill Rolled Wheat	Potter & Wrightington
6258	Pettijohn's Breakfast Food	American Cereal Company
6249	Cream of Wheat	Cream of Wheat Company
6251	Farinose	American Cereal Company
6252	Fould's Wheat Germ Meal	The Fould's Milling Company
6268	Germea	Sperry Flour Company
6250	Hecker's Farina	
6257	Old Plymouth Breakfast Food	Old Plymouth Cereal Company
6259	Pillsbury's Vitos	Pillsbury-Washburn Flour Mills
6260	Ralston Health Club Breakfast Food	Robinson-Danforth Company
6261	Wheatena	Health Food Company
6262	Wheatlet	The Franklin Mills
6265	Shredded Whole Wheat Biscuit	The Cereal Machine Company
	GLUTEN PREPARATIONS.	
6248	Cooked Gluten	Health Food Company
6253	Dr. Johnson's Glutine	Johnson's Educator Food Store
6269	Whole Wheat Gluten	Health Food Company
	MISCELLANEOUS PREPARATIONS.	
6266	Cook's Flaked Rice	American Rice Food & Mf'g Co.
6229	Glen Mills Standard Crushed Barley	Johnson's Educator Food Store
6267	Grape Nuts	Postum Cereal Company
6286	Malt Breakfast Food	The Malted Cereal Company

CEREAL FOODS, WHERE PURCHASED AND COST.

Laboratory number.	Where purchased.	Price paid per package.	Weight contents of package.	Weight contents of package.	Price paid per pound.
		Cents.	Grams.	Lbs.	Cts.
6230	James H. Snow & Co....................	5	400	.88	5.7
6231	Fred T. Hall & Co........................	12	1329	2.93	4.1
6232	J. C. Norton & Co.	13 (2 for 25)	1324	2.92	4.5
6233	Fred T. Hall & Co........................	15	1136	2.28	6.
6234	Staples & Griffin	In bulk	....	......	4.
6235	Staples & Griffin........................	In bulk	....	.....	4.
6245	Fred T. Hall & Co	55	2331	5.14	10.7
6242	Staples & Griffin	13 (2 for 25c.)	828	1.83	7.1
6244	Fred T. Hall & Co	15	933	2.06	7.3
6236	Staples & Griffin	In bulk	....	......	4.
6237	Fred T. Hall & Co	In bulk	....	......	4.
6238	James H. Snow & Co.....................	8 lbs. for 25c in bulk	....	......	3.1
6239	T. F. Cassidy & Son	10	849	1.87	5.3
6241	J. C. Norton & Co.	10	895	1.97	5.1
6243	Staples & Griffin	10	874	1.93	5.2
6240	J. C. Norton & Co.........................	4 cts. per lb., 7 lbs. for 25 cts., in bulk	....	......	4.
6246	J. C. Norton & Co.........................	13 (2 for 25c.)	851	1.88	6.9
6247	Staples & Griffin........................	5	554	1.22	4.1
6264	J. C. Norton & Co.........................	13 (2 for 25c.)	857	1.89	6.9
6263	Staples & Griffin........................	In bulk	....	......	4.
6254	J. C. Norton & Co.........................	10	578	1.27	7.9
6256	Fred T. Hall & Co........................	15	952	2.10	7.1
6258	J. C. Norton & Co.	13 (2 for 25c.)	841	1.85	7.0
6249	J. C. Norton & Co.	17	853	1.88	9.0
6251	Fred T. Hall & Co	15	936	2.06	7.3
6252	J. C. Norton & Co.........................	13 (2 for 25c.)	830	1.83	4.9
6268	J. C. Norton & Co.........................	15	795	1.75	8.6
6250	J. C. Norton & Co.........................	13 (2 for 25c.)	423	.93	14.0
6257	James H. Snow & Co.	15	853	1.88	8 0
6259	J. C. Norton & Co.	13 (2 for 25c.)	951	2.10	6.2
6260	J. C. Norton & Co.........................	15	857	1.89	8.0
6261	J. C. Norton & Co.	25	992	2.19	11.4
6262	J. C. Norton & Co.	13 (2 for 25c.)	859	1.89	6.9
6265	J. C. Norton & Co.........................	13 (2 for 25c.)	398	.88	14.8
6248	Staples & Griffin	25	416	.92	27.3
6253	Fred T. Hall & Co	25	410	.90	27.7
6269	James H. Snow & Co.....................	55 (5 lbs. bag)	2274	5.01	11.
6266	J. C. Norton & Co.........................	15	387	.85	17.6
6229	Fred T. Hall & Co	15	908	2.00	7.5
6267	J. C. Norton & Co.........................	15	428	.94	15.9
6286	A. A. Gilbert	15	675	1.49	10.1

PERCENTAGE COMPOSITION OF CEREAL FOODS CALCULATED TO WATER-FREE BASIS.

Laboratory number.	Name of Cereal Food.	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel value per gram.
	CORN PREPARATIONS.	%	%	%	%	Calo.
6230	Crown Flakes	9.23	.98	89.32	.47	4.359
6231	Hecker's Hominy	9.70	.67	89.17	.46	4.287
6232	H-O Company's New Process Hominy	9.09	.59	89.99	.33	4.321
6233	Mazama	9.66	1.10	88.67	.57	4.368
	UNCOOKED OAT MEALS.					
6234	A Oat Meal	18.76	8.27	70.18	2.79	4.789
6235	C Oat Meal	15.47	8.03	74.46	2.04	4.730
6245	McCann's Finest Oat Meal	13.18	10.59	74.27	1.96	4.773
	COOKED OAT PREPARATIONS.					
6242	Hecker's Oat Meal	20.77	8.11	69.01	2.11	4.829
6244	Hornby's H-O Oat Meal	14.75	8.86	74.30	2.09	4.733
6236	American Cereal Company's Rolled Oats	15.04	8.28	74.44	2.24	4.723
6237	American Cereal Company's Rolled Oats	16.39	8.11	73.38	2.12	4.661
6238	Buckeye Rolled Oats (in bulk)	16.08	8.07	73.64	2.21	4.659
6239	Buckeye Rolled Oats (in package)	15.97	8.16	73.72	2.15	4.718
6241	Echo White Rolled Oats	15.94	8.15	73.74	2.17	4.724
6243	Hecker's Rolled White Oats	15.80	8.91	73.24	2.05	4.783
6240	Peoria Rolled Oats	15.56	8.33	73.92	2.19	4.662
6246	Quaker Rolled White Oats	16.11	9.31	72.44	2.14	4.685
6247	Tip Top Rolled Oats	17.75	8.73	71.29	2.23	4.727
	WHEAT PREPARATIONS.					
6264	Fruen's Best Wheat Wafers	10.43	2.34	85.08	2.15	4.354
6263	Fruen's Rolled Wheat	10.62	2.26	85.18	1.94	4.307
6254	H-O Company's Breakfast Wheat	11.47	1.78	84.70	2.05	4.406
6256	Old Grist Mill Rolled Wheat	10.97	2.08	85.13	1.82	4.401
6258	Pettijohn's Breakfast Food	13.31	2.05	82.79	1.85	4.401
6249	Cream of Wheat	13.14	1.13	85.31	.42	4.372
6251	Farinose	15.59	3.32	79.50	1.59	4.479
6252	Fould's Wheat Germ Meal	12.24	2.61	83.61	1.54	4.325
6268	Germea	14.61	2.70	81.18	1.51	4.473
6250	Hecker's Farina	11.86	1.06	86.58	.50	4.378
6257	Old Plymouth Breakfast Food	14.75	2.47	81.55	1.23	4.458
6259	Pillsbury's Vitos	13.10	1.70	84.48	.72	4.410
6260	Ralston Health Club Breakfast Food	12.16	1.56	85.36	.92	4.379
6261	Wheatena	16.42	3.79	77.89	1.90	4.541
6262	Wheatlet	15.33	2.17	81.23	1.27	4.436
6265	Shredded Whole Wheat Biscuit	11.92	1.64	84.78	1.66	4.396
	GLUTEN PREPARATIONS.					
6248	Cooked Gluten	16.88	3.86	76.80	2.46	4.555
6253	Dr. Johnson's Glutine	15.31	.99	82.53	1.17	4.455
6269	Whole Wheat Gluten	17.89	5.20	73.85	3.06	4.628
	MISCELLANEOUS PREPARATIONS.					
6266	Cook's Flaked Rice	8.89	.16	90.52	.43	4.295
6229	Glen Mills Standard Crushed Barley	11.14	.96	86.76	1.14	4.326
6267	Grape Nuts	12.34	1.14	84.11	2.41	4.357
6286	Malt Breakfast Food	14.54	2.43	81.53	1.50	

WEIGHTS OF NUTRIENTS, AND FUEL VALUE OF ONE POUND OF CEREAL FOODS AS FOUND IN THE MARKET.

Laboratory number.	Name of Food.	Water.	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel value per pound.
	CORN PREPARATIONS.	Lb.	Lb.	Lb.	Lb.	Lb.	Calo.
6230	Crown Flakes	.120	.081	.009	.787	.004	1740
6231	Hecker's Hominy.	.110	.086	.006	.794	.004	1730
6232	H-O Company's New Process Hominy	.120	.080	.005	.792	.003	1725
6233	Mazama	.107	.086	.010	.792	.005	1770
	UNCOOKED OAT MEALS.						
6234	A Oat Meal	.067	.175	.077	.655	.026	2025
6235	C Oat Meal	.079	.143	.074	.686	.019	1975
6245	McCann's Finest Oat Meal	.051	.125	.101	.705	.019	2055
	COOKED OAT PREPARATIONS.						
6242	Hecker's Oat Meal	.091	.189	.074	.627	.019	1990
6244	Hornby's H-O Oat Meal	.093	.134	.080	.674	.019	1945
6236	American Cereal Company's Rolled Oats	.077	.139	.076	.687	.021	1975
6237	American Cereal Company's Rolled Oats	.069	.153	.076	.683	.020	1970
6238	Buckeye Rolled Oats (in bulk)	.074	.149	.075	.682	.021	1955
6239	Buckeye Rolled Oats (in package)	.080	.147	.075	.678	.020	1970
6241	Echo White Rolled Oats	.082	.146	.075	.677	.020	1965
6243	Hecker's Rolled White Oats	.086	.144	.081	.669	.019	1980
6240	Peoria Rolled Oats	.068	.145	.078	.689	.020	1970
6246	Quaker Rolled White Oats	.081	.148	.086	.666	.020	1955
6247	Tip Top Rolled Oats	.091	.161	.079	.648	.020	1950
	WHEAT PREPARATIONS.						
6264	Fruen's Best Wheat Wafers	.113	.093	.021	.754	.019	1750
6263	Fruen's Rolled Wheat	.106	.095	.020	.761	.017	1745
6254	H-O Company's Breakfast Wheat	.117	.101	.016	.748	.018	1765
6256	Old Grist Mill Rolled Wheat	.112	.096	.019	.756	.016	1775
6258	Pettijohn's Breakfast Food	.107	.119	.018	.739	.017	1780
6249	Cream of Wheat	.106	.118	.010	.763	.004	1775
6251	Farinose	.094	.141	.030	.720	.014	1840
6252	Fould's Wheat Germ Meal	.111	.109	.023	.743	.014	1745
6268	Germea	.115	.129	.024	.719	.013	1795
6250	Hecker Farina	.114	.105	.009	.767	.004	1760
6257	Old Plymouth Breakfast Food	.123	.129	.022	.716	.011	1775
6259	Pillsbury's Vitos	.093	.119	.015	.766	.007	1815
6260	Ralston Health Club Breakfast Food	.121	.107	.014	.751	.008	1745
6261	Wheatena	.086	.150	.035	.712	.017	1885
6262	Wheatlet.	.116	.136	.019	.718	.011	1780
6265	Shredded Whole Wheat Biscuit	.108	.106	.015	.756	.015	1780
	GLUTEN PREPARATIONS.						
6248	Cooked Gluten	.089	.154	.035	.699	.022	1880
6253	Dr. Johnson's Glutine	.102	138	.009	.741	.011	1815
6269	Whole Wheat Gluten	.112	.159	.046	.656	.027	1865
	MISCELLANEOUS PREPARATIONS.						
6266	Cook's Flaked Rice	.114	.079	.001	.802	.004	1725
6229	Glen Mills Standard Crushed Barley	.103	.100	.009	.779	.010	1760
6267	Grape Nuts	.053	.117	.011	.797	.023	1870
6286	Malt Breakfast Food	.080	.134	.022	.750	.014	

DISCUSSION.

Corn Preparations.

The first four materials in the table are corn products. They differ comparatively little from corn meal in composition, containing, however, somewhat less fat. The average of 19 samples of granular corn meal as compiled in Bulletin 28 of the Office of Experiment Stations shows that one pound contains .125 pounds of water; .092 pounds of protein; .019 pounds of fat; .754 pounds of carbohydrates and .010 pounds of ash. The only claim that the manufacturers make concerning Crown Flakes, Hecker's Hominy and H-O Company's Hominy is that they are carefully prepared from the best quality of corn and are thoroughly kiln dried, so as to keep well. The low percentage of fat indicates that all of these goods were made from corn from which the germ was more or less removed. The Mazama people make an unwarranted claim on the package. They say, a package "provides, when cooked and ready for the table, 23 pounds of unsurpassed food, sufficient to sustain in health and vigor a family of seven for twenty-four hours." Assuming that the family of seven consists of a man, his wife and five children from two to ten years of age, they would require for their nourishment for one day 1⅓ pounds protein and enough fats and carbohydrates to furnish altogether 17,000 calories. A package of Mazama carries a little more than .2 of a pound of protein and has a fuel value of little less than 4,500 calories.

Uncooked Oat Meals.

The "A" and "C" oatmeals were sold in bulk, being put up in barrels. They differ in composition no more than is to be expected. The "A" oatmeal contains three per cent more protein than the "C." The McCann's oatmeal was put up in a five pound tin can and according to the label was made by John McCann, Drogheda, Ireland. The package carried an analysis by the city analyst of Dublin which differs only slightly from that of the sample here reported. The protein in this meal is considerably less than in American goods. Its high cost is accounted for by the tin package and its being imported goods

It would be difficult to see why anyone should prefer it to American goods.

Cooked Oat Preparations.

Hecker's partly cooked oatmeal (No. 6242) and Hecker's rolled white oats (No. 6243) differ in price and, so far as these two samples are concerned, in composition. The former carries a third more protein than the latter. Very few oatmeals contain so high a percentage of protein as sample No. 6242. Hornby's H-O (No. 6244) carries about the average percentage of protein, althougn on this package there is an analysis which claims 17.63 per cent instead of 13.40 per cent which the sample examined has. The same analysis calls all of the ash phosphates, ("brain and nerves"), which is of course not strictly in accord with fact. The American Cereal Company put their goods up under at least three names and in four forms. Quaker oats are sold only in package, Buckeye oats in package and barrel, and American Cereal Company's oats in bulk. The only apparent difference in the four kinds is the price. The Buckeye oats in bulk retailed in Bangor at 3 1-8 cents per pound, the American Cereal Company's rolled oats in bulk at 4 cents. The Buckeye oats in package cost in Bangor 5.3 cents, and the Quaker oats 6.9 cents a pound. They are all good quality rolled oats, and there seems to be no reason why one should pay 6.9 cents a pound when apparently just as good goods, made by the same company, sell for less than half that price. All of the rolled oats are good goods from the chemical standpoint, and there are no greater differences in composition than one would expect. The goods of different companies differ no more than different samples from the same companies probably would.

Wheat Preparations.

Judging from the protein content of the different wheat preparations is would appear that they are nearly all made from the soft starch wheats. This is an excellent way to utilize wheat relatively low in gluten, which will, in consequence, not make strong flour. For bread flours no wheats are so good as the hard wheats of high gluten content. For one restricted to a diet of wheat products, the hard wheats are more desirable, but in a mixed diet there are other sources of protein, and the use of the softer wheats in mushes and the like is to be encouraged.

Fruen's Wheat Wafers at 6.9 cents a pound and Fruen's Rolled Wheat at 4 cents are apparently the same goods, one put up in paper, the other in barrels. The claims that these preparations are "the most natural food for mankind," "the great nerve, brain and muscle food," etc., are exaggerations, but we are so used to overstatement of facts in advertisements that probably no one is deceived by such claims.

The H-O Company's Breakfast Food claims to be made from California wheat, and the analysis, showing 10 per cent protein and 75 per cent of starch, indicates a soft wheat such as is grown in California.

Old Grist Mill Rolled Wheat is also made "from the finest California white wheat." Pettijohn's Breakfast Food "is made from selected Pacific coast wheat." The sample analyzed carries 2 per cent more protein than most of the above mentioned brands.

Cream of Wheat claims to be "composed almost entirely of pure gluten, is one of the healthiest and most nutritious foods known." It claims also to be "made from the very choicest of selected hard spring wheat and being almost pure gluten, is highly recommended for the use of diabetic persons." The claim that Cream of Wheat is "almost pure gluten" is false and should be criminal. As a food for people in health, Cream of Wheat is all right. Diabetic persons should avoid starch and sugar, and this preparation contains 75 per cent of these carbohydrates.

Farinose, "a pure preparation from Ohio's best amber wheat," is the richest in protein of any of the samples examined and in this respect more nearly resembles the oatmeals.

Fould's Wheat Germ Meal "is made from the glutinous portion of choice wheat." If this statement means (and it is evident that it was intended to convey this meaning) that in its manufacture the starchy part of the wheat is excluded, it is not true. Although made by a patented process, the resulting preparation chemically resembles ordinary white wheat preparations in starch and in protein content.

Germea is "prepared from the choicest California white wheat" by the Sperry Flour Company of San Francisco. The sample examined differs from the average of California wheat products by containing a higher percentage of protein.

Hecker's Farina, judging from appearance and composition, is a finely ground white wheat flour. The only drawback to the goods for the purposes mentioned on the wrapper is the high cost, 14 cents a pound.

The statement that "Old Plymouth Breakfast Food is made from carefully selected *glutinous* wheat" accords fairly well with its analysis which shows it to contain more protein than the most of the other wheat preparations examined. That it "is the most economical of all cereal foods" is not so evident. It costs at retail at the rate of 8 cents per pound, and equally good wheat preparations are sold in bulk at one-half the price.

Pillsbury's Vitos is the "choicest product of carefully selected Northwestern hard spring wheat." The analysis on the package calls for 16.64 per cent of protein, and the sample examined carries only 11.9 per cent. The first analysis corresponds with a hard wheat, while the sample reported bears evidence of having been made from a soft winter wheat. The claimed analysis shows 6.68 per cent of water; the sample examined carried 9.30 per cent.

Ralston Breakfast Food, "a perfect food made from selected wheat rich in gluten," is also apparently made from a soft winter wheat. The sample examined carries 10.70 per cent of protein, and hence could not have been made from a "wheat rich in gluten." It is a well made preparation, but its cost of 8 cents a pound is too high.

The Health Food Company's Wheatena contains the highest percentage of protein of any of the wheat preparations examined by the Station. While some of the claims made by the company for Wheatena are not fully borne out, they do call attention to the fact that it can be used, "in all cases and conditions and by all beings, *except such as suffer from the disease known as diabetes.*" Its high cost, 11.4 cents per pound, prevents its use as an economical cereal food.

"Wheatlet," made from choice selected wheat "especially rich in the nitrogenous elements," is a well prepared food of good composition, carrying a higher per cent of protein (13.6%) than most of the wheat preparations.

There is probably no other cereal food on the market so widely and extensively advertised as Shredded Wheat Biscuit. For the most part its advertising matter is free from exaggerated statements. Its chemical composition is that of good quality winter wheat. It is the highest in price of any of the wheat preparations, costing nearly 15 cents a pound. From this fact it should not have a place upon the table of those who are trying to live economically.

The average composition of the different classes of corn, oat and wheat preparations is compared with milk and a good quality of bread flour in the following table.

WEIGHT OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF THE MORE IMPORTANT CLASSES OF CEREAL FOODS AS FOUND IN THE MARKET COMPARED WITH MILK AND FLOUR.

Classes of Foods.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
	Pound.	Pound.	Pound.	Pound.	Pound.	Calories.
Milk	.865	.035	.042	.051	.007	337
Flour	.128	.131	.013	.723	.005	1645
Corn foods	.114	.084	.007	.791	.004	1740
Oat meals	.060	.148	.084	.682	.021	2018
Rolled oats	.081	.150	.078	.671	.020	1965
Wheat meals	.108	.124	.020	.737	.010	1790
Rolled wheats	.111	.101	.019	.752	.017	1765

Miscellaneous Preparations.

Cook's Flaked Rice is "manufactured from the best Carolina head rice." It has practically the same composition as raw rice, but is cooked ready for use. Rice is much lower in protein content than wheat or oats, and more nearly resembles Indian corn in composition. Best Carolina head rice retails for 10 cents a pound. The price asked for the cooked flaked rice in packages makes its cost about 15 cents per pound.

Glen Mills Crushed Barley has about the same composition as bolted barley meal. Its cost, 7½ cents a pound, is about that of the wheat preparations in packages.

Malt Breakfast Food is prepared "from the best barley malt and the choicest wheat." It contains as much protein as the best of the wheat foods. The analysis here reported agrees as closely as would be expected with that on the package.

Grape Nuts, manufactured by the Postum Cereal Company, is "made by special treatment of entire wheat and barley." These goods have nearly the same proximate composition as the wheat foods. Part of the starch has been changed into dextrin and grape sugar. The claims of the makers are preposterous. Grape Nuts "are a condensed food." "Four heaping teaspoons of Grape Nuts are sufficient for the average meal." "The system will absorb a greater amount of nourishment from 1 pound of Grape Nuts than from ten pounds of meat, wheat, oats, or bread." A man at moderate work needs per day about .28 pounds of protein and sufficient fats and carbohydrates in addition to make the potential energy of the day's food 3,500 calories. Four heaping teaspoonfuls of Grape Nuts weigh about 1 ounce. The protein and energy needed for one meal (1/3 of 1 day) and that furnished by 4 heaping teaspoonfuls of Grape Nuts are compared in the following table:

	Protein —lbs.	Fuel value —calories.
Needed for 1/3 day by man at moderate work..	.090	1,175
Furnished by four heaping teaspoonfuls, (1 oz.) of Grape Nuts..........................	.007	117

It would require .77 pounds of Grape Nuts (3/4 of a package) to furnish 1/3 of the protein needed for one day for a man at moderate work; the energy needed would be afforded by .63 pounds.

The nutrients of beef are more completely digested and absorbed than those of vegetable foods. There is no reason for thinking that Grape Nuts would be more completely digested than rolled oats, wheat flour or wheat bread. About 85 per cent of the protein and of fuel value of vegetable foods are digested and rendered available to the body. In the following table there are compared the pounds of protein and fuel values of one pound of Grape Nuts with "ten pounds of meat, wheat, oats or bread."

POUNDS OF PROTEIN AND FUEL VALUE OF ONE POUND OF GRAPE NUTS COMPARED WITH 10 POUNDS OF BEEF, ROLLED WHEAT, WHEAT FLOUR, ROLLED OATS AND BREAD.

	Protein —lbs.	Fuel value —calories.
1 pound of Grape Nuts	.12	1,870
10 pounds round steak, including bone	1.90	8,950
10 pounds beef rump, including bone	1.29	14,050
10 pounds rolled wheat	1.01	17,650
10 pounds bread flour	1.31	16,450
10 pounds rolled oats	1.50	19,650
10 pounds white bread	.80	12,200

While there is no question that Grape Nuts is a good cereal food, it is difficult to understand why the manufacturers should make claims so absurd and contrary to fact.

Gluten Preparations.

It was the intention to confine this study to the breakfast cereals, but as local physicians were prescribing certain so-called gluten foods for diebetic patients, the three in most common use were analyzed. Gluten preparations, containing as high as 70 per cent of protein, were on the market five years ago, and there are now preparations carrying from 30 to 50 per cent of gluten which can be used with reasonable safety by persons suffering from diabetes. As is seen from the table, the Health Food Company's Cooked Gluten, Dr. Johnson's Glutine, and the Health Food Company's Whole Wheat Gluten carry only a little more protein and a little less carbohydrates than ordinary flour. Samples of flour made from the hard spring wheat of the Northwest not infrequently carry more protein that the sample of Dr. Johnson's Glutine and nearly as much as the two other samples here reported upon. Too much can hardly be said in condemnation of the foisting, by false statements in advertising, such materials upon diabetic patients, imposing upon physicians as well as the public. As articles of food for healthy persons, or for the undernourished, those so-called glutens are excellent, and whole wheat gluten at 11 cents a pound is no more expensive than some breakfast cereals. The two others each cost at retail about 27 cents a pound. The analyses of these materials compared with ordinary bread flour bought by the Station in the open market are given, calculated on dry matter, in the table which follows:

COMPOSITION OF WATER-FREE-MATERIAL OF ORDINARY BREAD FLOUR AND THREE GLUTEN MATERIALS.

	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value.
	%	%	%	%	Calories.
Bread Flour	15.02	1.50	82.91	.57	-
Cooked Gluten*	16.88	3.86	76.80	2.46	4555
Whole Wheat Gluten*.	17.89	5.20	73.85	3.06	4628
Dr. Johnson's Glutine	15.31	.99	82.53	1.17	4455

* Made by the Health Food Company.

PECUNIARY ECONOMY.

While the composition of foods would seem to be a matter of prime importance, to the average consumer the cost is a matter of equal importance. An intelligent selection can be made only by considering both factors. In the following table there is shown the amount of the various constituents that can be purchased for 10 cents at the prices mentioned, milk at 5 cents per quart and flour at 3 cents per pound being added for comparison.

A study of the table shows that protein is furnished more cheaply by oat preparations than by those of corn or wheat. The oats also supply fat 10 times as cheaply as the corn products, and 5 times as cheaply as the wheat foods. The carbohydrates are supplied most economically by the corn preparations, oats ranking second. In fuel value, oats again rank first.

If wheat flour be included in the comparison, it will be found to be the cheapest source of protein and carbohydrates. With the exception of one sample of rolled oats, it also leads in fuel value.

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AMOUNTS OF NUTRIENTS FURNISHED FOR TEN CENTS IN CEREAL FOODS AT ORDINARY PRICES, COMPARED WITH MILK AND FLOUR.

Name of Food.	Prices per pound.	TEN CENTS WILL PAY FOR—					
		Total food materials.	Nutrients.				Fuel value.
			Total.	Protein.	Fats.	Carbo-hydrates.	
	Cts.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Calo.
Milk	2.5	4.00	.51	.14	.17	.20	1350
Flour	3.0	3.33	2.88	.43	.04	2.41	5471
Crown Flakes	5.7	1.75	1.54	.14	.02	1.38	3047
Hecker's Hominy	4.1	2.44	2.16	.21	.01	1.94	4221
H-Company's New Process Hominy	4.5	2.22	1.95	.18	.01	1.76	3832
Mazama	6.0	1.67	1.48	.14	.02	1.32	2956
A Oat Meal	4.0	2.50	2.27	.44	.19	1.64	5065
C Oat Meal	4.0	2.50	2.26	.36	.19	1.71	4940
McCann's Finest Oat Meal	10.7	.93	.86	.12	.09	.65	1910
Hecker's Oat Meal	7.1	1.41	1.25	.27	.10	.88	2807
Hornby's H-O Oat Meal	7.3	1.37	1.21	.18	.11	.92	2667
Rolled Oats, American Cereal Company's	4.0	2.50	2.26	.35	.19	1.72	4935
Rolled Oats, American Cereal Company's	4.0	2.50	2.28	.38	.19	1.71	4920
Buckeye Rolled Oats (in bulk)	3.1	3.23	2.92	.48	.24	2.20	6318
Buckeye Rolled Oats (in package)	5.3	1.89	1.70	.28	.14	1.28	3720
Echo White Rolled Oats	5.1	1.96	1.77	.29	.15	1.33	3855
Hecker's Rolled White Oats	5.2	1.92	1.72	.28	.16	1.28	3805
Peoria Rolled Oats	4.0	2.50	2.27	.36	.19	1.72	4928
Quaker Rolled White Oats	6.9	1.45	1.30	.21	.12	.97	2832
Tip Top Rolled Oats	4.1	2.44	2.16	.39	.19	1.58	4753
Fruen's Best Wheat Wafers	6.9	1.45	1.25	.13	.03	1.09	2539
Fruen's Rolled Wheat	4.0	2.50	2.19	.24	.05	1.90	4365
H-O Company's Breakfast Wheat	7.9	1.27	1.10	.13	.02	.95	2243
Old Grist Mill Rolled Wheat	7.1	1.41	1.23	.14	.03	1.06	2501
Pettijohn's Breakfast Food	7.0	1.43	1.26	.17	.03	1.06	2548
Cream of Wheat	9.0	1.11	.99	.13	.01	.85	1968
Farinose	7.3	1.37	1.22	.19	.04	.99	2522
Fould's Wheat Germ Meal	4.9	2.04	1.79	.22	.05	1.52	3558
Germea	8.6	1.16	1.01	.15	.03	.83	2083
Hecker's Farina	14.0	.71	.62	.07	.01	.54	1249
Old Plymouth Breakfast Food	8.0	1.25	1.08	.16	.03	.89	2219
Pillsbury's Vitos	6.2	1.61	1.44	.19	.02	1.23	2919
Ralston Health Club Breakfast Food	8.0	1.25	1.09	.13	.02	.94	2183
Wheatena	11.4	.88	.79	.13	.03	.63	1656
Wheatlet	6.9	1.45	1.27	.20	.03	1.04	2580
Shredded Whole Wheat Biscuit	14.8	.68	.59	.07	.01	.51	1210
Cooked Gluten	27.3	.37	.33	.06	.01	.26	696
Dr. Johnson's Glutine	27.7	.36	.32	.05	.00	.27	653
Whole Wheat Gluten	11.0	.91	.78	.14	.04	.60	1696
Cook's Flaked Rice	17.6	.57	.50	.04	.00	.46	984
Glen Mills Standard Crushed Barley	7.5	1.33	1.18	.13	.01	1.04	2342
Grape Nuts	15.9	.63	.58	.07	.01	.50	1179
Malt Breakfast Food	10.1	.99	.89	.13	.02	.74	

APPLE INSECTS OF MAINE.

F. L. HARVEY AND W. M. MUNSON.

Specific directions for spraying the apple for insect and fungous pests have been prepared by one of the writers and will be sent, free of cost, on application to the Agricultural Experiment Station, Orono, Maine. The indiscriminate killing of insects should, however, be guarded against, as all are not injurious. Many are parasites upon the injurious species, or at some period devour their eggs or young.

These beneficial insects should be recognized when seen, and should be protected and encouraged. Attention is particularly called to the ichneumon, syrphus and tachina flies, and to the lady birds and ground beetles, illustrated in plate I. The ichneumon flies have four wings and are related to the wasps and bees. There are numerous minute forms which prey upon the eggs and larvæ of injurious insects, and larger forms that deposit their eggs upon the caterpillars. Syrphus and tachina flies are two-winged insects, the former of which, in the larval stage, devour plant lice, and the latter are parasitic upon the larvæ of other species. The lady birds and ground beetles are carnivorous, feeding upon both larvæ and perfect forms of other insects.

In the following pages only the more important insects injurious to the apple are discussed, and methods of treatment suggested.

EXPLANATION OF TERMS.

An insect with a complete life history passes through four stages; viz., egg, larva, chrysalis or pupa, and imago or mature insect. The egg hatches into the larva—i. e. caterpillar, worm, grub, or maggot, as the case may be; the larva, after a time, changes to the pupa or chrysalis, which is the inactive or resting state, and may be naked or enclosed in a cocoon; the pupa, after a longer or shorter period, develops into the imago or perfect insect.

A. Insects Affecting The Trunk and Branches.

THE ROUND-HEADED APPLE TREE BORER. *Saperda candida,* Fabr.

The round-headed borer was first recorded in 1824 by Thomas Say, but was doubtless a native of America, widely distributed at that time, though unnoticed. While it prefers the apple, it also affects the native crab apple, sugar pear, thorn bush, pear, quince, and roundwood.

Description.

Eggs.—Minute, yellowish white.

Larva.—When full grown about one inch long; footless, yellowish white. Head small, chestnut brown, polished, hornlike; jaws two, black; the second joint large and broad, the next two narrow. Rings of the body (segments), from the fourth to the tenth inclusive, armed on the upper side with two fleshy warts.

Pupa.—Lighter colored than the larva and with transverse rows of minute spines on the back.

Perfect Insect.—A beetle, about three-fourths of an inch long, with two broad white stripes extending from the head to the ends of the wing cases; cinnamon brown above; hoary white below; legs, antennæ and face whitish.

Life History.

The eggs, according to Mr. Chas. Pope, who has gathered hundreds of them, are laid in a short slit, made by the beetle with the ovipositor, in the smooth bark. Sometimes the eggs are laid in the bottom of the slit next to the wood, but generally in an opening made in one side of the slit, half way through the bark. Several eggs, sometimes ten or a dozen, are laid on the same tree, being distributed around the trunk usually within six inches of the ground, but occasionally higher and sometimes at the base of the limbs. They are deposited from June to September, in Maine. The egg soon hatches and the young larva gnaws its way into the inner bark and sap wood. When winter comes the young borer works its way, in the wood, below the surface of the soil. In the spring it ascends and passes the second summer in the sap wood. It spends the second winter below the surface of the soil, as it did the first. The third summer it ascends and bores deep channels in the wood in every direction and finally bores upward and outward, nearly to the bark, lines the cavity with borings and transforms to the pupa. The third spring it emerges, deposits its eggs, and the cycle of life is complete.

Vulnerable Points and Remedies.

The eggs are laid in the bark, in plain view, and can be readily detected and taken out. The young larvæ are readily located by the flow of sap from the wound they make, and by the chippings they push out of the mouth of the borings.

The perfect insect may be prevented from depositing eggs by the application of repellants to the trunk of the tree, e. g., tarred paper, or a mound of earth. Soft soap, or whitewash, applied to the trunk of thetree in June and July, is said to prevent the beetle from laying hereggs on the treesthus protected. Thetrees should be examined twice each year, in May and September, and the young larvæ removed. Should any escape, and penetrate deeply into the wood, they may be destroyed by probing with a sharp wire.

THE FLAT-HEADED APPLE TREE BORER. *Chrysobothris femorata,* Fabr.

This insect, a native of America, is common in Maine. Besides the apple, it is known to attack the pear, plum and peach, also the oak, box-elder, hickories and maples. The injury attributed to the round-headed borer is often due to it.

Description.

Eggs.—Pale yellow, varied, with one end flattened, irregularly ribbed.

Larva.—Soft, flesh-like, pale yellow; head small, deeply set; jaws black; third segment twice as broad as any of the posterior ones, and bearing on its upper surface a large, oval, callous-like projection, covered with numerous raised brown points.

Pupa.—Lighter colored than the larva and with transverse rows of minute spines on the back and a few at the extremity of the body.

Perfect Insect.—A beetle, variable in size but usually about one-half inch long, oblong-flattish in shape, of a dark, dull greenish color with a coppery reflection; under side and legs brilliant copper color; feet green. On each wing case are two irregularly oblong spots of deeper copper color than the remainder of the wing, dividing the wing cases into three nearly equal portions. The upper surface appears as though sprinkled with an ash-colored powder.

Life History.

The beetle makes its appearance in June or July in our latitude. It loves the light and may frequently be seen about the orchard on the trees. It is very active and hard to catch, quickly taking wing. It lays, probably, about one hundred eggs.

The female fastens her eggs, singly or in groups, to loose flakes of bark, or in the crevices, by means of a glutinous substance. The eggs soon hatch and the young larvæ gnaw through the bark and live on the sap wood, making flat channels next to the bark, sometimes girdling the trees. As they get older they bore upward into the solid wood and, when ready to change to the chrysalis, gnaw to the bark and nearly through it. They then change to the chrysalis, and in about three weeks the beetles come forth. The larvæ attack the trunk and larger branches and remain in the tree but one year.

Vulnerable Points and Remedies.

Same as for the round-headed borer.

THE OYSTER-SHELL BARK LOUSE. *Mytilaspis pomorum,* Bouché.

The oyster-shell bark louse is a native of Europe and was introduced into this country, on nursery stock, about a hundred years ago. It is widely distributed, and is exceedingly common in Maine. The twigs of apple trees are often literally covered with the scales, causing great injury. Besides doing great damage to apple trees, this scale is found on the pear, plum, cultivated and wild currant, roundwood, dog wood, and several other shrubs and trees.

Description.

Eggs.—White, changing to yellowish or reddish with age, oblong, about .01 inch long; from 20 to 100 under each scale.

Young females.—Wingless, white and about .01 inch in length, move about quickly, appearing on the branches as small white specks which finally attach themselves, by their beaks, to the new shoots, where the scale is perfected.

Scale of female.—Wingless, about .08 of an inch long, narrow, widened at the posterior end, curved and shaped somewhat like an oyster shell. Brown or grayish, closely resembling the bark in color. Most frequently placed with the small end toward the tip of the twig.

Scale of male.—Much smaller than the female, wedge shaped and straight; usually placed on the leaves and rarely seen. The male insect undergoes a complete metamorphosis, and in the perfect form is provided with two wings.

Life History.

The eggs hatch late in May or early in June. If the weather is cold, the lice remain under the scale until warm weather, when they may be seen running about the twigs for a location to attach themselves. The most of these fix themselves around the bases of the side shoots of the twigs, by means of their tiny slender beaks, and live upon the sap of the tree. They gradually undergo changes. Before the close of the season the louse secretes the scale under which it lives and perfects itself. By the middle of August the female becomes a bag of eggs, which are deposited in a mass under the scale, the body of the louse shriveling, as the eggs are laid, until it is a mere speck at the small end of the scale. These eggs remain under the scale, if not destroyed, until the following spring and then hatch, completing the life history.

How this pest is spread from tree to tree is not well made out, but it is supposed that birds carry them on their feet and that large insects may transport them or that the wind may blow the young about. They are probably introduced into young orchards on the nursery stock and multiply.

Remedies.

During the winter examine the twigs and scrape off the scales, after which, wash with a strong solution of caustic soda or washing powder, applied with a stiff brush. In June, while the lice are still active, spray with an alkaline solution, or better, with kerosene emulsion.

There are several natural enemies which help to keep the insect in check. One of the most important of these is a species of mite, which preys upon the louse as well as upon its eggs. This mite is so small as to be seen only with a microscope.

Another important aid in controlling this pest is the twice-stabbed lady-bird. Both larva and perfect beetle devour large numbers of the lice. The mature form of this insect is readily recognized by its polished black wing-cases with a blood-red spot on each.

THE PEAR-BLIGHT BEETLE, OR SHOT-BORER. *Xyleborus pyri,* Peck=*X. dispar,* Fabr.

This is a native species that attacks hemlock, beech, oak, and cedar, and has transferred its depredations to apple trees in Maine. We have received from several localities specimens of apple limbs that were literally honeycombed with small channels that extended through the laburnum and heart wood to the center. The young larvæ bore into the wood, making deep channels which in small twigs interfere with the circulation of the sap, and the twigs wither, giving the appearance of blight, hence the name pear-blight beetle. The work of this beetle should not, however, be confounded with the pear-blight proper, which is caused by bacteria. The exit holes through the bark were .06 of an inch in diameter and nearly circular, looking like small shot holes. The wood was green, showing that the insect attacks the growing tree. Living wood does not appear to be essential to the life and comfort of this species, for after a period of several weeks we found in a limb that had been in a dry place in a box, young larvæ, full grown larvæ, pupæ, and perfect beetles.

Description.

So far as we know, the eggs have not been described. They must be very small and are said to be laid at the bases of the buds. We have never seen them.

When the larvæ are full grown they transform to pupæ in the burrows, and finally emerge as small beetles about one-tenth of an inch long and of a dark brown or nearly black color, with the antennæ and legs of a rusty red. The thorax is short, very convex, rounded and roughened. The wing covers are marked by longitudinal rows of punctures. The hind part of the body slopes abruptly. The beetles leave their burrows in July and deposit eggs before August.

Remedies.

As the beetles work wholly under the bark they cannot be reached by insecticides. The only way is to watch the trees during the latter part of June and July and, if blighted twigs or diseased limbs are noticed, examine the branches for small pin holes; if found, the presence of this or some related species may be suspected. The diseased limb should at once be cut far enough below the injury to include all the burrows, and burned, to prevent the beetles emerging and attacking new trees. As these beetles live in forest trees, orchards near timber are more liable to become infested.

THE WOOLLY LOUSE OF THE APPLE. *Schizoneura lanigera,* Hausm.

Two forms of this insect are recognized by entomologists. One, known as the apple-root plant-louse, attacks the roots, producing wart-like excrescences or swellings. The other form, known as the woolly louse of the apple, is the one found in Maine. It feeds upon the sap of the trunk and branches. The two are regarded as the same species, living under different conditions. The above ground form occurs most abundantly, in this country, in New England. Entomologists differ in their opinions regarding its nativity; some accredit it to America; most are inclined to think it originated in Europe, where it is much more destructive than in this country.

This insect, in the root form, was noticed in this country as early as 1848, when thousands of trees were found so badly infested that they had to be destroyed. Since then the insect has been reported as doing more or less damage in every section of the country. The pest is distributed upon nursery stock, and the importance of carefully examining nursery stock before setting is strongly urged.

Description and Life History.

The eggs, which are very minute, are laid in the crevices of the bark at or near the surface of the ground.

The young when first hatched appear like specks of mold, being covered with fine white down. As they get older, the cottony covering becomes more distinct, apparently issuing from the pores of the skin of the abdomen and attaining considerable length. The young have beaks longer than the body and, when grown, this organ is fully two-thirds the length of the body. By means of the beak, they attach themselves to the roots or branches, and when abundant, draw heavily upon the vitality of the tree, or may even kill it.

When full grown the females are about one-tenth of an inch long, oval; head and feet black; legs and antennæ dusky; abdomen yellowish; body covered with white mealy powder; a tuft of long, easily detached down upon the hinder part. Under each patch of down is usually found a female and her young. During the summer the females are wingless and the young are produced alive. Toward the fall the broods contain both winged females and winged males, which have not much down on them and are plump and nearly black. The fore wings are about twice as long as the narrow hind ones. These winged females fly about to other trees and lay eggs, establishing new colonies. During the early part of the season this form of the insect is found in clusters about the base of the trunk, upon suckers or twigs springing from the trunk, but in autumn they commonly attack the axils of the leaves and sometimes cover the whole under surface of the limbs and trunk, making the tree look as though whitewashed.

Remedies.

In early spring wash the tree with a strong solution of soft-soap or washing powder. Later in the season spray with kerosene emulsion.

B. Insects Affecting the Foliage.

THE BUD MOTH. *Tmetocera ocellana,* Schlieff.

This is probably one of the worst pests to apple orchards in Maine. It works in the unfolding flower, and leaf buds of orchard trees, often doing great damage to the crop, besides attacking nursery stock and young trees. It seems to be on the increase in Maine and did much damage in the season of 1899. It is an European insect but is now widely distributed in the northern U. S. and Canada. Besides the apple, it feeds upon the pear, plum, cherry, quince and peach trees, and in Maine has been bred from blackberry plants.

Description.

Eggs.—Disc-shaped, transparent, flattened, usually oval or sometimes circular in outline. The center of the disc elevated, the outer flat rim attached to the leaf.

Larva.—When first hatched, greenish, with head and first thoracic segment black. It molts four times before hibernating. The half-grown caterpillar, which appears on the buds in spring, is about one-sixth of an inch long, brown, with a black head, thorax, shield and legs. When full fed, about the last of June, it changes to the pupa stage within a tube of dead leaves.

Pupa.—Light brown, about a quarter of an inch long. On the back of each abdominal segment are two transverse rows of teeth directed backward.

Perfect Insect.—A moth with three-fifths inch spread of wings. It may be known by the ash-gray color of the fore wings, which are banded across the middle with a cream white band.

Life History.

The half-grown, brown, hibernating caterpillars usually emerge from winter quarters about the time the buds begin to expand, their first appearance depending on the advance of the season, and ranging over two or three weeks. When they are out early, they gnaw into the buds. If the buds are open they crawl inside. They attack both flower and leaf buds, fastening the parts together with silken threads, forming a nest, within which they feed upon the enclosed tender flower or leaf parts. They do not confine their depredations to a single leaf or flower in the bud, but increase the injury done by sampling nearly all. They sometimes bore down the stems a few inches, killing the terminal shoots. The bud attacked turns brown, making the nest conspicuous. The caterpillars feed mostly at night for six or seven weeks and molt three times. When full grown the caterpillar forms a tube out of leaves, which it lines with thin, closely woven silk, and within it soon changes to the pupa. In about ten days the pupa works its way nearly out of the tube by the hooks on its back. The skin splits open and the moth appears. The moths are on the wing during the latter part of June and the first of July. They fly mostly at night, resting on the trees during the day time, when they are easily detected by the white bands on the wings. They live two or three weeks, during which time they mate and the eggs are laid. The eggs, which resemble small fish scales, are laid singly or in clusters, mostly at night, on the under side of the leaves. The eggs hatch in seven to ten days. The young larvæ feed upon the epidermis of the leaf, forming a silken tube for protection. After the fourth molt, which occurs the last of August or the first of September, or before the leaves fall, they leave the silken tubes and form a silken winter home (*hibernaculum*) on the smaller twigs near the buds, in which they spend the winter. The appearance of the hibernating larva in the spring completes the cycle of life.

Remedies.

Pull off and crush the withered clusters of leaves containing the caterpillars and chrysalids early in spring.

Spray with Paris green or with Bordeaux mixture and Paris green, as soon as the buds begin to swell in the spring.

THE OBLIQUE-BANDED LEAF ROLLER. *Cacœcia rosana,* Harris.

This is a native species, reported from several localities in the United States, and one of several species responsible for the destruction of the buds and foliage of apple trees. We have bred it from the leaves of the apple, currant and strawberry in Maine. It also feeds upon the plum, pear, peach, cherry, rose, and a great variety of other trees and shrubs.

Description.

Eggs.—So far as we know, the eggs have not been described.

Larva.—Length .8 of an inch; livid green when young, becoming yellowish green, reddish or brownish with age. Head oval, top of first segment yellow or brown; usually a darker green stripe along the back. The posterior half of the segments wrinkled transversely, and bearing a few minute tubercles from which single hairs arise. When mature the larva spins a silk lining to the leaf in which it lives and changes to a chrysalis of a dark brown color from which emerges the moth.

Perfect Insect.—A short, broad, flat, bell shaped moth, with about one inch spread of wing. The wings pale, reddish brown, crossed with wavy, pale brown lines and with three oblique darker brown bands, one of which covers the base of the wings, another the middle and the third a triangular spot on the front margin near tne tip.

Life History.

As soon as the leaves start, the caterpillars begin to coil up and fasten together the young leaves which they feed upon, and in which they find shelter. They attack the buds, leaves and also the young fruit, gnawing its surface or eating deep holes into it. They are full grown the last of June or early in July, when each lines its leaf house with silk, and changes to the chrysalis, from which the moth emerges the last of July. There is a second brood in August. We know nothing of its egg laying habits, or how or where it spends the winter.

Remedies.

The same remedies may be used for this insect as for the bud moth.

THE LESSER APPLE LEAF FOLDER. *Teras minuta,* Robr.

This is another of the small moths that do damage to the buds and leaves of the terminal shoots of the apple tree. It is particularly bad in Maine. It is said to be specially bad in nursery stock, and young orchards, but large trees also suffer. This is a well known cranberry insect and may get into orchards from the bogs.

Description.

Eggs.—The eggs, so far as we know, have not been described.

Larva.—A small, greenish yellow, active caterpillar, with a pale brown head. When disturbed it seeks the more secluded parts of its burrow, or if too much molested, wriggles out and drops to the ground.

Chrysalis.—Within the folded leaf, the larva spins a silken web and changes to a brown chrysalis, three-tenths of an inch long. There is a characteristic knob-like projection from the head end of the chrysalis.

Perfect Insect.—A small moth, with one-half inch spread of wing. There are three broods and the insect is dimorphic, the moths of the third brood being very different in color. These dimorphic forms were thought to be different species until carefully bred and studied. The moths of the first two broods have the head, thorax and fore wings a bright orange color; the hind wings, body and legs are whitish with a silken lustre. The moths of the third brood have the fore wings of a uniform ash-gray, or slate color with reddish luster by oblique light; hind wings light colored and semi-transparent.

Life History.

The gray-colored moths of the third brood hibernate in some sheltered place during the winter. In the early spring they come forth and deposit their eggs on the buds or unfolding leaves. The eggs hatch in a few days and the larvæ crawl between the unfolding leaves and begin feeding upon them, often fastening one or more leaves together by a silken web and living within them. They live upon the epidermis and pulp, but sometimes gnaw holes in the leaves, and sometimes forsake the nest, to feed on adjacent exposed leaves. When mature they spin a silken lining to the leaf and change to the chrysalis, where they remain about a week, and early in May the orange-colored moths of the first brood come forth. The larvæ of the second brood appear the last of May or early in June, and the moths the last of June or in July. The moths of the third brood appear in August, and hibernate, completing the round of life.

Vulnerable Points and Remedies.

The young larvæ of all the broods are exposed when they first hatch and before their leaf shelter is made. The same remedies apply to this insect as to the bud moth.

THE FOREST TENT CATERPILLAR. *Clisiocampa disstria,* Hübner.

There are two tent caterpillars in the eastern United States; the apple tree tent caterpillar, *Clisiocampa Americana,* and the forest tent caterpillar, which was called by Prof. Harris *Clisiocampa sylvatica,* but in recent literature is known as *Clisiocampa disstria.* Both species are common in Maine but are often confounded. Though similar in their life history, they are readily separated by differences in the egg clusters, caterpillars and moths.

Distinguishing Characteristics.—Egg clusters of this species, the same diameter throughout, docked off squarely at the ends; caterpillars with a row of spots along the back; oblique lines on the wings dark colored; web inconspicuous, closely attached to the limbs or trunk and easily overlooked. Insect restless, wandering from tree to tree. Occurs in orchards but, being a general feeder, is more commonly found on forest or shade trees, from which habit it receives its common name.

Description.

Eggs.—The egg clusters, composed of about 300 to 400 eggs, are attached to the terminal twigs of the food plant. They are of the same diameter throughout and cut off squarely at the ends. The eggs are creamy white, rounded at the base, enlarging upwards, narrowing again at the top and terminated by a circular rim on the border and a sunken spot in the center. They are held to the twig and to each other by a brown varnish, which also covers the egg clusters, protecting them from the weather and probably from their enemies.

Larva.—The eggs hatch in the early spring, usually about the time the buds are bursting. The time, however, varies with the exposure of the egg clusters to the sun, and also with the season. In Maine they are hatched the last of April or early in May. Sometimes, during continued warm weather, the eggs hatch before the leaves start, and cold weather comes on afterwards. The young larvæ are very hardy, however, and are not often killed. We have kept them alive in breeding cages for three weeks without food. They will eat the varnish on egg clusters. As soon as hatched they spin a web wherever they go, possibly to enable them to retrace their steps. Soon the branches are lined with these silken paths along which they travel in search of food. They shed their skin (molt) four times, changing color and markings in the first three. They are full fed in about six weeks, though the growth may be hastened or retarded by the weather or food supply. At this time they may be seen wandering about for a suitable place to spin their cocoons.

Cocoon.—The larva spins a whitish-yellow cocoon, resembling that of the apple tree tent caterpillar, and by preference folds it in a leaf, but often attaches it to loose bark or about fences, houses or other places of concealment. Inside of the cocoon the caterpillar changes, in two or three days, to the chrysalis. In two or three weeks the moths emerge.

Perfect Insect.—A brownish yellow moth, expanding an inch and a half or more. The fore wings marked by two oblique brown lines, the space between them usually darker than the rest of the wing. The moths eat nothing. After they have mated and laid their eggs, they die, completing the life history.

Remedies.

(a) Collect the egg clusters in winter when the trees are bare.

(b) While young the caterpillars can be destroyed by spraying with Paris green, but when half grown the amount of poison they get in feeding will not kill them.

(c) After the third molt, they collect in bunches, on the trunks and branches, and can be reached by hand or by spraying. A solution of one pound of washing powder in four or five gallons of water, applied to the bunches by means of a swab attached to a long pole, has proved effectual.

(d) After the caterpillars begin to collect in bunches, or even before, spread a sheet of canvas under the tree. Climb the tree and with a padded mallet suddenly jar the branches on which they rest, and they will fall on the canvas and can be swept up and destroyed. This method is applicable to both orchard and shade trees, and would recommend itself to town authorities, as by the employment of a few men for a few days in June, in Maine, the shade trees could be protected.

(e) Put bands of cotton, or of tarred paper bearing a ring of a mixture of equal parts of sulphur and lard, around the trees, or use any other practical method to prevent them from ascending the trees. In our own experience a band of paper covered with the lard and sulphur mixture has proved an absolutely effectual barrier.

(f) The moths are night fliers and are attracted by electric lights and many are probably destroyed this way. The caterpillars, cocoons and moths should be destroyed by hand whenever possible.

(g) The city of Rochester, N. Y., has successfully enlisted the services of the school children in protecting the city shade trees. Pride in one's city adornment could be thus stimulated in pupils, and by collecting the egg clusters, caterpillars, cocoons and moths, a valuable and practical lesson in nature study would be learned. It would pay town authorities to offer a small bounty, if need be, to stimulate the collecting. All specimens collected should be burned.

Remarks.

For a fuller consideration of this insect and illustrations of all the stages in its life history, the reader is referred to Maine Experiment Station Report, 1888, p. 164; 1889, p. 188; 1890, p. 138, and 1897, p. 173; or to the Maine Agricultural Reports of the corresponding years.

THE APPLE TREE TENT CATERPILLAR. *Clisiocampa Americana,* Harris.

This insect is a native of North America and occurs wherever apples are grown. It has given more or less trouble to apple growers since the early settlement of the country. While it prefers wild cherry, and selects the apple as second choice, it feeds upon plum, peach, rose, and other members of the rose family; also upon the oak, poplar, willow, birch, witch hazel, beech, etc.

Description and Life History.

Eggs.—Dull gray; the upper end circular with a dark spot in the center. They are laid in clusters round the twigs and covered with varnish to protect them from the weather. There are from fifty to two hundred and fifty in a bunch.

Larva.—When first hatched they are dull black and sparsely covered with gray hairs. They appear about the time the leaves start, but if ahead of them, may feed for a time upon the varnish covering the eggs. They molt about six times. The larvæ soon begin to spin a web which increases in size by additional layers of silk as the worms grow, until it is sometimes ten inches or more across. The worms remain in the tent at night, during stormy weather and when not feeding, unless the weather is warm, in which case they may often be seen upon the outside, literally covering the web. They march in military order twice a day from the nest to feed, once in the morning and once in the afternoon.

They pave their roads with silk and follow along them to the leaves. When mature, each worm will consume two leaves a day and an average of five hundred leaves would be required for a colony. There are often several webs in a tree. The effects are to rapidly defoliate the tree and draw heavily upon its vitality to produce new leaves. The caterpillars require about six weeks to mature and are then about an inch and three-fourths long. The worms have a "white line along the back, then a yellow line dotted with black, then a black stripe marked with blue and yellow dots, then a wavy yellow line dotted with black, then a blue stripe dotted with yellow, then a broken white line; head black, under side of body black, the body covered with yellowish or whitish hairs." When mature the larvæ leave the tree and wander about in search of a place to spin their cocoons. They prefer the loose bark of trees, or the under side of fence caps, and will enter sheds and porches and climb the sides of houses and transform under the edge of clapboards, window caps and eaves. When the orchard is near they become a nuisance by entering the house.

Cocoon.—Oblong oval, light yellow, formed of a loosely woven, outer covering and a dense, tough, inner coat. The larva enclosed becomes a brown chrysalis and in about three weeks the moth appears.

Perfect Insect.—A moth of a pale, dull, reddish or reddish-brown color. The fore wings crossed by two oblique, parallel, dirty-white lines. The female is larger than the male. The male has feathery antennæ. The moth has no mouth and takes no food and lives only a few days. Its office is to lay the eggs.

Remedies.

Most of the remedies suggested for the forest tent caterpillar are equally valuable in controlling this insect. As this species does not migrate, the jarring and the protective bands are useless.

THE FALL WEB WORM. *Hyphantria cunea,* Drury.

The fall web worm is a native insect which has from time to time done great damage to forest and fruit trees. It is a general feeder, having been observed to feed upon over one hundred different species of trees, shrubs and herbs. It makes a web which is sometimes very conspicuous, attaining dimensions of several feet. The web can readily be told from that of the apple tree tent caterpillar.

We found this insect abundant in western Maine on July 5 when the webs were already quite conspicuous. In "Forest Insects," issued from the U. S. Department of Agriculture, Dr. Packard, on page 244, says: "The name fall web worm is most expressive for New England and other northern states where the insect is single brooded, appearing there during August and September, while in more southern regions it is double brooded." Though we have not traced this insect through its life history in Maine, and cannot positively say that there are two broods, yet the fact that the webs were conspicuous and the larvæ fully three-fourths of an inch long early in July, would indicate two broods in western Maine.

Description.

Egg.—About one-sixth inch long, bright golden yellow, globular, ornamented with numerous regular pits, which, according to Packard, give it, under the magnifying lens, the appearance of a beautiful golden thimble.

Larva.—Pale yellow when young, with two rows of black marks along the body, a black head and sparse hairs. Full grown larva usually pale yellowish or greenish with a broad, dark stripe along the back and a yellowish stripe along the side, covered with whitish hairs that spring from black and orange yellow warts. The caterpillars are somewhat variable as to depth of color and marking, even on the same tree. The fall brood is generally darker colored than the spring brood.

Cocoon.—Thin, almost transparent, composed of a slight web of silk intermixed with a few hairs from the caterpillar, or sometimes mixed with sand when the cocoon is spun in the soil.

Pupa.—Length .6 inch, breadth in the middle, .23 inch; dark brown, smooth, polished, faintly punctuate, and bulged a little all around in the middle.

Perfect Insect.—A moth which varies greatly in size and color. These color varieties have received different names by entomologists, but are now reduced to *H. cunea,* Drury. The most common form is white or slightly fulvous with white wings, but the wings show variations from pure white to those profusely dotted with black and brown. Front thighs tawny yellow, sometimes marked with a large black spot; feet blackish; expanse of wings one and one-fourth to one and two-thirds inches. Male moth usually smaller with the antennæ doubly feathered beneath. The antennæ of the female possesses two rows of minute teeth.

Life History.

The female deposits her eggs in clusters, laid in regular rows or smaller irregular patches, on either side of the leaves, usually near the end of a branch. Each female lays on an average about five hundred eggs. Those for the first brood are deposited by the last of May or during June, and the time required for them to hatch depends upon the weather. Under favorable circumstances they mature in about ten days, or those of the second brood in eight days. As soon as the caterpillars hatch they spin a small silken web which soon becomes conspicuous. Under this they feed together, upon the upper surface of the leaves. As they grow, other leaves and branches are included until the web reaches considerable size and contains dead leaves and the molt skins of the larvæ. If their fcod supply gives out, they quit the web and drop to the ground and crawl directly toward other trees with almost unerring instinct, or, when disturbed, let themselves down by a thread and by this regain the tree when the danger is past.

When full grown they are nearly two inches long and leave the web and wander about for suitable places to spin their cocoons. They select crevices in bark, the angles of tree boxes, rubbish about the base of trees, and other similar situations, while the fall brood prefer to bury themselves in the earth if possible, but adapt them elves to circumstances. They soon spin their cocoons. The pupæ contained in these hatch into the second brood of moths about the f rst of August, and the moths lay eggs which hatch into caterpillars that feed, mature, and spin their cocoons during August and September. The insects invariably spend the winter in the chrysalis state in the cocoon, and the following spring the moths emerge and lay their eggs, thus completing the life history.

Remedies.

Spray with Paris green before the insect makes much headway. If there are but few webs on the tree, cut off the branches and burn. Another effective remedy is a strong alkali, whale oil soap, or washing powder solution applied with a swab.

There are several predaceous insects which attack the larvæ, the most important being the spined soldier bug, *Podisus spinosus* (Dallas).

THE LIME TREE WINTER MOTH. *Hybernia tillaria,* Harris.

This is a native species often associated with the fall canker worm, which it resembles very much in its life history. It seems to remain and do damage when the fall canker worm has disappeared.

Description.

Eggs.—Pale yellow, oval and marked with a network of raised lines. They can be distinguished from the eggs of the canker-worm by their color and form. (See Report Maine Experiment Station, 1888, p. 167, Fig. 20).

Larva.—When full grown, about an inch and a quarter long; head dull red with a V-shaped mark on the front; yellow above and marked with many longitudinal black lines; the under side paler. Like the larva of the canker worm, it is a span or inch-worm, but it is larger than the caterpillar of that species.

Female Moth.—Wingless, spider-like, yellowish white; sides marked with black dots. Each ring of the body, excepting the last, which has only one, bears two black dots. Head black in front; antennæ thread-like. Ovipositor jointed and retractile; legs ringed with black. The larger size, the spotted back, and the black rings on the legs readily distinguish this from the wingless females of the fall and spring canker worms.

Male Moth.—Expanse of fore wings an inch and a half; color rusty buff, sprinkled with brownish dots and with two transverse, brown, wavy, lines, the inner most distinct. Between the bands and near the anterior edge is usually a brownish dot; hind wings paler; body color of fore wings; antennæ feathered. Like most of the moths of the inch worms, the wings are very delicate. The moths of the canker worm are on the wing at the same time, but they are smaller and are thus readily distinguished.

Life History.

The eggs, which are laid in situations similar to those of the canker worm, hatch early in the spring and the young larvæ feed upon the foliage of the apple tree, basswood, elm, hickory, etc., and when full grown, about the middle of June, they usually let themselves down by a silken thread, enter the ground about five or six inches and form a little oblong cell, within which they change to the chrysalis state. In October or November (sometimes not until the following spring), the moths appear. The wingless females climb the trees or other objects where they meet the winged males, pair and soon deposit the eggs in clusters, usually upon the branches of the trees they have infested, completing the life history.

Remedies.

The life history of this species is so nearly like that of the canker-worm that the remedies suggested for that insect are applicable to this. It has never done as much damage as the canker worm, but it is capable of doing much injury to the foliage of apple trees.

THE APPLE LEAF BUCCULATRIX. *Bucculatrix Pomifoliella,* Clemmens.

This moth was described by Clemmens in 1860. It is known to be widely distributed, having been reported from Texas, Missouri, Massachusetts, New York, and now from several localities in Maine. It has done considerable damage to the foliage of apple trees especially in New York.

Description.

Eggs.—So far as we know, the eggs of this species have never been described. They must be quite small as the cocoons of this diminutive moth have been mistaken for insect eggs. They are said to be laid upon the leaves.

Larva.—About one-half inch long when mature, cylindrical, tapering at both ends. Joints of the body rounded and prominent, color dark yellowish, with a greenish tinge and reddish shades on the anterior segments. Body armed with short black hairs which are more numerous on the back of the first segment. Head small, brown and ellipsoidal. The larvæ are active and when disturbed suspend themselves by a silken thread.

Cocoons.—Dirty white, slender, about one-fourth inch long, ribbed longitudinally by about six prominent ridges, oblong, tapering at both ends, flattened on the side to which it is attached. Usually fastened to the twigs and branches in groups.

Chrysalis.—Dark brown, rough, punctured on the back, about one-tenth of an inch long. When ready to transform, the chrysalis works itself partly out of the cocoon and the moth comes forth.

Perfect Insect.—A small moth that has only about one-fourth inch expanse of wings. Fore wings whitish, tinged with pale yellow and dusty brown. On the middle of the inner margin is a conspicuous oval brown spot; a wide streak of the same color on the opposite margin extending nearly to the end of the wing, where it tapers and points to a small circular brown spot near the tip.

Life History.

This insect spends the winter in the pupa state in the cocoon, usually attached to the twigs and branches of the host plant. There is reason to believe that the larvæ, when full grown, sometimes desert the host plant and form their cocoons on other plants close by. We have seen cocoons on the side of a building in Maine. About the time the leaves unfold, the moths come forth and lay their eggs upon the tender foliage. The larvæ are full grown in July. The specimens sent us in July were in the larval form and went into the chrysalis state in August and emerged the following spring, a fact which would indicate only one brood in Maine. Prof. Riley believed that there are two or three broods in the latitude of St. Louis, Mo. In the latitude of New York, Prof. Lintner states that there are two broods, one in July and one in September.

In September or October the cocoons in which the pupæ spend the winter are formed. The larvæ feed externally upon the foliage, at least the leaves we have received had the upper epidermis and pulp eaten away in patches, the veins and lower epidermis intact.

Remedies.

(a) Jar the trees when the larvæ are full grown and they will suspend themselves by threads and can be swept down by a broom and killed by hot water or crushed.

(b) Apply kerosene emulsion with a spraying pump in winter, to the branches that bear the cocoons. The same application might be made for the first brood when the foliage is on.

(c) If in small numbers, the cocoons may be removed during the winter months by hand.

(d) Spray with Paris green, as for other leaf eating insects. This small moth is preyed upon by several parasites that attack the larvæ and hold the pest in check, and some of the cocoons probably suffer somewhat from inclemency of the weather. Possibly birds may eat them, but we find no record of observations.

THE WHITE-MARKED TUSSOCK MOTH. *Orgyia (Notolophus) leucostigma*, Sm. & Abb.

During the past ten years specimens of the above insect, in the egg, larval and wingless female stages of its life history, have been received at the Experiment Station from various parts of the State. It is a native species and is apparently widely distributed, having attracted considerable attention as an apple insect.

Description.

Eggs.—Three or four hundred in a mass, attached to the empty grayish cocoon previously occupied by the female moth. Egg mass convex, smooth, grayish-white; composed of several layers of eggs, with a frothy, gelatinous material between them.

Larva.—When mature, over one inch long; bright yellow; head, and two small protuberances on the back carrot-red; back ornamented with four cream-colored brush-like tufts; two long black plumes near the head and one near the posterior end of the body; sides clothed with yellow hairs; brown or black stripe on the back, and a dusky stripe on each side.

Cocoon.—Gray; spun on the inside of a leaf. Texture loose and the silk interwoven with numerous hairs from the caterpillar. Chrysalis, enclosed in the cocoon, oval, brown or sometimes whitish below, covered with whitish hairs or down.

Perfect Insect (female).—Wingless or wings mere rudiments; light gray, oblong-oval; body distended with eggs; legs long.

Perfect Insect (male).—Winged, expands an inch and a quarter; fore wings crossed by wavy bands of darker shade; a small black spot on the outer edge of the wing toward the tip; beyond it an oblique blackish stripe, near the outer hind angle a minute white crescent; body gray, with a small black tuft near the band of the abdomen; antennæ feathered.

Life History.

During the winter months there will occasionally be found in the orchard, dead leaves attached to the branches of the trees. Upon examination these will usually be found to contain an empty, gray cocoon with a mass of eggs attached to it, as described above. These eggs hatch, in Maine, about the first of June, or earlier farther south. The young larvæ at once begin to devour the leaves of the tree. When disturbed they lower themselves by means of a silken thread which they climb when danger is past. The beautiful caterpillars described above feed about two months and then spin their cocoons. The moths soon emerge and the wingless females, being little more than animated masses of eggs are sluggish. The males, having wings, are able to fly, and they meet the females while resting upon the empty cocoon to which the mass of eggs is finally attached. If there is only one brood, the eggs do not hatch until the following spring; if two broods, the eggs soon hatch, producing the second brood of caterpillars which complete their growth late in the season and enter the chrysalis state. The moths soon emerge, mate, and the female lays the eggs on the cocoon, completing the life history.

Remedies.

Collect and destroy the eggs and cocoons during the winter. Spray with Paris green, or with Paris green and Bordeaux mixture. Usually no special treatment is required for this insect if the trees are thoroughly protected from the tent caterpillar.

THE FALL CANKER WORM. *Anisopteryx pometaria,* Harris.

This insect has been very bad at times in Maine, doing much damage to fruit and shade trees. Parasites and other enemies soon control it, however, so that it does not usually do damage in the same locality more than two successive seasons.

Description.

Eggs.—Grayish, flattened above, with a central puncture and a brown circle near the border. Each female lays 100 or 200 eggs in rows arranged in clusters on the twigs or branches, or on fences and buildings, usually in exposed situations.

Larva.—Pale olive green when young, but varying in color, when grown, from greenish yellow to dark brown. Dorsal band broad, brownish; lateral lines three, white, the middle one paler; broad brown bands below the lateral lines, and below that a broad white band. Under side, flesh-colored; head brown.

These caterpillars belong to the group of inch or measuring worms, because they alternately loop and extend the body in moving. When at rest they sometimes assume an erect position, and can hardly be told from twigs. When full grown they are about one inch long. When mature they crawl down the trunk or let themselves to the ground by a silken thread, and burrow to a depth of from two to six inches. They make a tough cocoon of buff colored silk interwoven with earth, and in twenty-four hours turn into the chrysalis.

Chrysalis.—Light greyish brown; about half an inch long. The male slender, and provided with wing cases; the female larger, and without wing cases.

Perfect Insect (male).—A moth provided with wings, the fore wings brownish gray, glossy, crossed by two whitish irregular bands, the outer one enlarging into a pale spot at the apex. Hind wings grayish brown with a white band crossing them, and in the center a faint blackish dot.

Perfect Insect (female).—Wingless; uniform shining ash color above, gray beneath; length three to four-tenths of an inch. Sluggish of movement and spider-like in appearance.

Life History.

The eggs hatch about the time the buds on the apple trees expand. The young worms feed upon the tender leaves, seeking shelter within the expanding flowers or buds when the weather is wet and cold. They eat holes in the leaves while young, but when older devour the whole pulp of the leaf, leaving only the veins and midrib. They feed for about four weeks, and when numerous so injure the foliage as to give the trees the appearance of having been scorched with fire. They have done great damage to the foliage of trees along highways. While letting themselves down to the ground they are often swept off by carriages and carried long distances.

The larvæ enter the ground, spin cocoons and are changed immediately into the chrysalis state, from which, during the fall, winter and following spring, they emerge in the perfect form, completing the life history.

Remedies.

Since the females are wingless, they may be trapped and destroyed by placing bands of tarred paper about the trunks of the trees and smearing these with printer's ink, tar mixed with oil, or refuse molasses. As these materials soon dry, however, they must be frequently renewed, or the insects will be able to cross. Tin or lead troughs, containing crude petroleum, are also used with some success. The most effective treatment, however, is to spray with Paris green, just as soon as the insects appear. Delay in applying the poison is often fatal to success.

There are numerous natural enemies, including a small mite, which destroys the eggs; a species of Microgaster,—a small four-winged fly,—parasitic upon the larvæ; and a species of tachina fly, also parasitic upon the larvæ.

THE APPLE TREE APHIS. *Aphis mali,* Fabr.

This insect was originally from Europe, but is now a pest in apple orchards throughout the northern United States and Canada, often causing serious losses in young orchards and nurseries.

Description.

Eggs.—Minute, oval, light yellow or greenish when first laid, gradually changing to shining black.

Young Insects (male).—Head, thorax and antennæ black; neck usually green; abdomen short, thick, oval, bright green; sides with row of black spots; nectaries and tail-like appendages black; wings transparent with dark brown veins.

Perfect Insect (female).—Length of wingless form less than one-tenth inch; body oval, pale yellowish green, often striped with deeper green; eyes and tail appendages black; honey tubes green. The winged female resembles the male in color.

Life History.

The eggs are deposited in the autumn in the cracks of the bark of twigs and at the bases of the buds. The eggs hatch when the buds begin to expand and the lice locate themselves on the young buds and leaves by means of their beaks and feed upon the juices. The spring brood is composed of females and is about ten days reaching maturity. Each louse gives birth to living young, producing about two a day for two or three weeks, and then dies. These young become mothers in about ten days. This process is continued through the season, there being many generations, mostly wingless females, without the appearance of males. Winged females are sometimes produced which, migrating to other trees, spread the pest. Late in the season males and females are produced in the same brood and, after mating, eggs are laid to perpetuate the species, thus completing the life history.

Remedies.

Wash the trees during winter or early spring with a strong solution of soft soap, or of washing powder, to destroy the eggs. Later in the season, if the aphids become numerous, spray with kerosene emulsion or with a strong decoction of tobacco, made by pouring 1 gallon of boiling water over a pound of tobacco stems or leaves.

There are many natural enemies of the aphis which should be encouraged. Among these are seven or eight species of lady-birds, and the larvæ of syrphus flies and of chrysopa or lace winged flies.

THE RED-HUMPED APPLE TREE CATERPILLAR. *Œdemasia concinna,* S. & A.

This species is native to the United States and has been reported from several localities in Maine as doing considerable damage to the foliage of apple trees. It is said to be widely distributed in this country, but is not an abundant species. It prefers the apple, but is known to feed upon the plum, cherry, rose, thorn, and pear,—plants belonging to the rose family.

Description.

Eggs.—The eggs, so far as we know, have not been described.

Larva.—When full grown, the larvæ are often an inch and a quarter long. They may be known by the coral-red head and a hump of the same color on the fourth ring or segment from the head. The body is striped lengthwise with narrow yellow, white and black lines. There are two rows of black spines along the back, and rows of shorter black spines on the sides. Each spine bears a fine hair. The spines on the coral red hump are more prominent than the others. The hinder end of the caterpillar tapers and is usually elevated when the insect is at rest. When handled, a fluid with a strong acid smell is emitted. This is so offensive that the insects are never eaten by birds.

Perfect Insect.—A moth which measures from an inch to an inch and a quarter across the wings. The fore wings are dark brown on the inner, and grayish on the outer margin. There are several longitudinal streaks along the margin, also a dot near the middle and a spot near the angle, all dark brown. The body is light brown, and the thorax of a darker shade.

Life History.

The moths are on the wing late in June or in July. The female deposits her eggs on the under side of a leaf, in a cluster, usually during July. They soon hatch into small caterpillars. These caterpillars, while young, feed upon the tender tissues of the under side of the leaf, leaving the upper surface unbroken, but when large they devour greedily the whole leaf, excepting the midrib. They reach maturity during August and September. There is but one brood in the northern states. In the broods further south, the caterpillars feed in bunches and when not feeding remain close together. When mature they descend to the ground and hide under leaves or rubbish, or sometimes burrow a little into the ground and slowly change to the chrysalis state, where they remain until the following spring, when the moths appear, completing the life history.

Remedies.

As these caterpillars go in flocks, and when not feeding remain close together, they may easily be destroyed by cutting off the branch on which they appear and burning it. They may also be destroyed by jarring the limb, and, when they fall to the ground, trampling them under foot. Spraying with Paris green is also effective, but poison should be used with caution on bearing trees. It is said that ichmeumons are parasitic upon them and hold them in check.

THE CECROPIA EMPEROR MOTH. *Platysamia cecropia,* Linn.

This is a native species and the largest moth found in the United States. It is widely spread and a general feeder. It is a well known apple insect, and, though not abundant, attracts attention on account of its large size and voracious appetite. It has been reported in its various stages from every part of Maine.

Description.

Eggs.—Nearly one-tenth of an inch long, almost round, dull creamy white, with a reddish streak near the middle.

Larva.—When first hatched, black with shining black knobs on the body from which arise black hairs. It molts several times in coming to maturity. When full grown it is from three to four inches long and pale green. There are coral red warts on the third and fourth segments, yellow warts on the back of the other segments, except those on the second and terminal, which are blue like the smaller tubercles on the side.

Cocoons.—About three inches long, pod-shaped, rusty grey or brown and firmly attached to one side of a twig. Composed of two layers of silk, an outer loose, papery, fibrous one and a densely woven inner one which contains the brown chrysalis.

Perfect Insect.—A moth with from five to seven inches spread of wing. Both the front and hind legs are rich brown. About the middle of each wing is a kidney-shaped white spot shaded with red and margined with black. Near the tips of the fore wings is an eye-like spot containing a bluish white crescent.

Life History.

The moth lays from two to three hundred eggs, usually in pairs, firmly fastened to the under side of the leaves of the host plant. The eggs hatch in a week to ten days, the young larvæ first feeding on the empty egg-shells. They have a ravenous appetite, grow rapidly, and consume a large amount of food. When nearly mature, a few on a young apple tree may in short time strip it of leaves. The larvæ, when full grown in the fall, spin their cocoons, attaching them to the twigs of shrubs or trees on which they feed. Their great size makes them conspicuous objects after the leaves fall. The following spring, in May or

June, the moths appear and soon mate, completing the life history.

Remedies.

The larvæ and cocoons are not abundant, and are so conspicuous that hand picking is the most satisfactory treatment.

C. Insects Affecting The Fruit.

THE CODLING MOTH. *Carpocapsa pomonella,* Linn.

The codling moth is probably native to southeastern Europe, the native home of the apple. It was introduced into the United States probably in apples or pears, early in the history of the country, but it was not noticed until 1849, its work previously having been referred to the plum curculio.

It is found in most of the apple growing countries of the world and is widely distributed in Maine, being one of the worst apple insects. The larvæ, particularly of the second brood, are often in apples when marketed, and crawl out and go into the pupa stage when the apples are stored or exposed for sale. It is not uncommon to see the moths in the spring in apple outhouse cellars, or on the windows of stores and houses.

While the codling moth is more particularly an apple insect, it feeds also upon pears, wild haws, crab apples and quinces, of the pome fruits, and upon plums, apricots and cherries of the stone fruits. Specimens have been reared from the fruit of a species of screw bean and from the seed buds of roses.

Description.

Egg.—A thin scale, slightly smaller than the head of a pin; whitish, often with a yellowish tinge, semi-transparent, looking like a minute drop of milk on the skin of the fruit.

Larva.—Whitish, flesh-colored or pink; one-sixteenth of an inch long when hatched; three-fourths of an inch long when full grown; three pairs of true legs and five pairs of false legs; head, first thoracic and anal segments brown; body armed with a few short hairs arising from more or less distinct black spots.

Cocoon and pupa.—When mature the larva spins, in a day, a thin tough silken cocoon, the inner layer thin and white, the outer layer mixed with pieces of the bark or substance on which the cocoon rests. Within the cocoon, or later, the larva changes to the brown pupa.

Moth.—Spread of wing about three-fourths of an inch. Front wing crossed by numerous gray and brown lines, which are often wavy, the hind angle marked by a large, dark brown spot streaked with bronze or gold. The hind wing light greyish-brown with a darker margin. The males have a pencil of long black hairs in a furrow on the upper surface of the hind wing, and on the under side of the front wing an elongate, narrow, black spot.

Life History.

The eggs are laid on the surface of the fruit, on its stem, or on the adjacent leaves. Between the middle of May and the middle of June, a week or two after the blossoms have fallen and the fruit is from a half-inch to an inch in diameter, the young larvæ craw about on the surface of the fruit. The most of them find their way into the blossom end, where they remain feeding for several days, and finally bore to the core of the fruit. They are full grown in about three weeks, when they make their exit channel to the surface. After feeding a few days near the surface, they emerge and usually spin cocoons under the loose bark of the trunk of the tree. Those designed for the first brood change soon to the pupa and the moths emerge in about two weeks, to lay eggs for the second brood. Those that go into the cocoon in August, and later, remain in the larval state in the cocoon during the winter and emerge as moths the following spring. In Maine only part of the first brood transform to moths the same season. When the moths appear, whether the same season or the following spring, the life history is complete.

Remedies.

As soon as the blossoms fall, spray the trees with Paris green, or with Paris green and Bordeaux mixture. The fallen fruit should be gathered and destroyed. Hogs or sheep may be kept in the orchard for the purpose. Owing to the protection afforded by the apple, the larvæ are particularly free from natural enemies. There are, however, two species of ichneumon flies which are occasionally found as parasites.

THE PLUM CURCULIO. *Conotrachelus nenuphar,* Herbst.

The plum curculio is a native of this country and originally fed upon the wild plums, which it still infests. Both males and females puncture the fruit to feed on it, but only the latter make the crescent-shaped cuts. This insect is known to infest the plum, peach, nectarine, apricot, cherry, apple and pear. From ten to twenty-five per cent of the early apples examined in July, showed the characteristic cut.

After the first of August but few cuts, made by this insect, were found and we are led to believe that they prefer the earlier varieties, and that the apples punctured do not mature. A large per cent of the larvæ which hatched did not reach maturity. We, however, succeeded in transforming enough to identify the species. It would seem that the plum curculio does not flourish well in the apple and attacks it in the absence of its favorite fruit. The decline in the cultivation of plums, due to the ravages of this pest, and the black knot, will account for its attacking apples.

Description.

Egg.—Oblong, oval, pearly white. Visible to the naked eye, and can be found readily by examining the crescent-shaped cut made by the female.

Larva.—When young, tiny, soft, footless; head distinct, horny. When full grown it is usually of a glossy yellowish white, but varies in color with the food; head light brown or yellowish. Along each side is a light line, below which is a row of black bristles and above it a less distinct one, and toward the hind extremity a few pale hairs; length about two-fifths of an inch. The larva is so transparent, the internal organs are plainly seen through the skin, imparting a reddish color to the central parts of the body.

Perfect Insect.—A beetle, belonging to the family of insects known as weevils or snout beetles. It is blackish or greyish, rough, with a black shining hump on each wing case near the middle, behind which is a dull ochre-yellow band marked with whitish about the middle; each thigh has two small teeth on the under side; snout short. Length of insect about one-fifth of an inch.

Life History.

The beetles hibernate in secluded spots during the winter and appear on the wing about the time the plum trees blossom. As soon as the young fruit forms, the eggs are deposited. The female, when about to lay an egg, makes a minute incision with her jaws and then, inserting the snout, enlarges the hole sufficiently to hold the egg, turns around, deposits the egg, thrusts it to the bottom of the hole with the snout, then cuts a crescent-shaped incision around one side of the opening.

Only one egg is laid in a place, though on the apple, several punctures may occur on the same fruit. Each beetle lays from fifty to one hundred eggs and deposits from five to ten a day. The time of depositing eggs by early and late beetles probably occupies about two months. The first apples examined, July first, were badly punctured and no new cuts were found after the twentieth of the month. The eggs hatch in a few days and the larva is full grown in from three to five weeks. The infested apples or plums usually drop to the ground before the larva is grown and when mature it leaves the fruit, enters the ground four to six inches, forms an oval cavity, changes to the chrysalis, and in from three to six weeks the perfect insect is formed and makes its way to the surface, completing the life history. There seems to be some reason for believing that a few remain in the ground all winter. The specimens we transformed appeared in September, about four weeks from the time the larva was mature. We are inclined to believe that those apples in which the egg hatches and the larva grows, drop early. Abortive cuts shrivel and deface the fruit and check its growth, but it may mature.

Remedies.

Spraying with Paris green early in the season and after the blossoms fall is sometimes practiced. On a few trees in the garden, the jarring method employed for plum trees may sometimes be used to advantage. There are many insects which devour the curculio larva as it escapes from the fruit. Foremost among these are two or three species of common ground beetles. The larva of the soldier beetle is also a useful destroying agent, often entering the fruit while still on the tree, in search of its prey.

THE APPLE MAGGOT. *Trypeta* (*Rhagoletis*) *pomonella,* Walsh.

This is a native species which originally fed upon thorn plums, and probably wild crab apples, and has transferred its depredations to cultivated apples. It first attracted attention nearly fifty years ago, and as early as 1867 was doing great damage in New York, Massachusetts, Connecticut and Vermont. Since that time it has spread and increased until it is now widely distributed and regarded as one of the worst pests of the apple.

It is particularly bad in Maine, attacking nearly all varieties of apples, both fall and winter, though most destructive to the early sweet varieties. It is known as the railroad worm in Maine.

Description.

Eggs.—Length .032 to .036 inch; breadth .008 to .009 inch; light yellow when taken from the fruit; fusiform and about four times as long as wide; pedicellate at the end. The larva is placed in the egg with the head away from the pedicel and the end containing the head is inserted into the apple.

Larva.—Length .28 to .32 inch; breadth .07 to .08 inch. When full grown usually yellowish white. When younger, and sometimes when full grown, tinged with greenish; footless; the body composed of fourteen segments. Ninth, tenth and eleventh segments widest, narrowing rapidly toward the head, which is small, pointed and emarginate. From the broadest segment the body slopes slowly backward to the last segment, which maintains its size one-third of its length and then abruptly slopes to one-half its thickness. The lower and posterior half is nearly vertical behind, giving the larva a docked appearance.

Pupa.—Length .17 to .21 inch; breadth .08 to .1 inch; pale yellowish brown. When the maggot assumes the pupa state it does not shed the larval skin, but contracts, assuming an oval form. The pupa is a little more than twice as long as wide, and barrel-shaped. The ends slope about equally, and the head end is very pointed. Otherwise the resemblance between the pupa and larva is apparent. There is quite a variation in the size of pupæ. Some are much longer and thicker than others and may be of females, as the female flies are much larger than the males.

Perfect Insect.—A two-winged fly somewhat smaller than the house fly. Readily recognized by its general black color; yellowish head and legs; dark feet; greenish prominent eyes; white spot on the back and upper part of the thorax; three white bands across the abdomen of the male, four on the female, and four black bands across the wings, resembling the outlines of a turkey.

Life History.

In early seasons, under favorable conditions, the flies in Maine begin to emerge about July first, and earlier in the states farther south. They continue to emerge all summer and are on the wing in abundance until the middle or last of September, and occasionally in October. Early frosts check them. The flies lived three weeks in confinement and will probably live longer in nature. They begin to deposit their eggs in the early fruit by July first, or earlier, and egg laying continues while the flies are on the wing. The earlier races of flies affect the earlier varieties, and the later races, the fall and winter fruit. Each female is capable of laying between three and four hundred eggs, and possibly more, which are inserted from time to time, one in a place, by means of a sharp ovipositor through the skin of the apple. The eggs being successively developed in the ovary of the female, after the manner of the eggs of the barnyard fowl, the season of egg laying extends over considerable time. The eggs are vertically inserted into the pulp of the apple, with the end opposite the pedicel, which contains the head of the maggot, pointing toward the core. The eggs are deposited in all parts of the apple, usually upon the cheeks, sparingly near the calyx and stem ends, and more abundantly upon the pale or shaded side of the fruit. The time required to deposit the eggs is about one-half minute. By means of the sharp ovipositor a characteristic puncture is made through the skin of the apple. These punctures can be detected by careful observation with the naked eye, but a pocket lens is necessary to see them well. They appear as brownish specks, and have not been before distinguished from the brownish, rusty spots common on apples. Under the glass they appear as circular or oblong openings, surrounded by a brownish border, somewhat shrunken by the shriveling of the tissue beneath. They may be numerous on the same apple.

The eggs hatch in four or five days, under favorable conditions, and the minute larvæ begin at once to work in the pulp of the apple. They have no true opposable jaws, but the head is provided with two black curved hooks, situated above the mouth, with which they rasp the pulp of the fruit rapidly by means of a vertical movement of the head. They live upon the juice of the particles of apple thus detached, which is sucked into the mouth. The pulp is rejected and turns brown. They can burrow their length in soft fruit in less than a minute. The channels made by the young larvæ, while the fruit is still growing, are largely healed and neither they nor the minute white larvæ are likely to be detected by the naked eye, or by the casual observer. As the larvæ grow, and the fruit matures, the enlarged channels do not heal, but turn brown and the presence of the maggots is then readily detected. These channels meander through the whole fruit, even the core. They often cross each other, enlarge as the larvæ grow, and in the last stages of Trypeta work, run together, producing large cavities. Finally they involve the whole fruit, rendering it a worthless mass of disgusting corruption, held together by the skin.

In the early stages of Trypeta work there is no external evidence that the fruit is infested, excepting the punctures made for the insertion of the eggs. In advanced Trypeta work, brownish trails, where the larvæ have come to the surface, can be seen through the skin. Apples marketed with no suspicion of their being infested are frequently found hopelessly involved, honeycombed and worthless. Apples apparently sound when gathered may, by the presence of eggs or young larvæ, afterwards become worthless. The newly hatched larvæ are a little shorter than the egg and can not readily be detected in the white pulp of the apple without a pocket lens. They attain their growth, under favorable circumstances, in four or five weeks, but their development may be arrested by cold, by insufficient food, hardness of the fruit, etc., for a great length of time. They ordinarily remain in the fruit but a short time after they mature, and often leave it and go into the pupa state while there is still an abundance of nourishment and the fruit is still occupied by younger larvæ of various ages. If the fruit is kept cold, the larvæ, though full grown, remain longer, or may even change to the pupa state, within it. We have never seen the exit holes in hanging fruit and believe the maggots do not drop, but go into the ground from the fallen fruit. Their presence causes the fruit to mature earlier. Fruit picked from the trees may contain larvæ, and often stored or marketed fruit is alive with maggots.

The exit openings are characteristic, irregular holes, about one-twelfth inch in diameter, surrounded by a brownish border. They look as though the maggots had gnawed a hole for the head, and then forced the body through, leaving a lacerated border. They may occur anywhere on the apple but are more frequently found where the brown larval trails show through the skin. They begin to appear in the early apples about the first of August and may be found until frost, in windfalls, and in the stored fruit as long as the larvæ remain.

It would seem that the development of the larvæ is so nicely timed that they are not mature until the fruit is ripe. Their development is slower in late and in hard fruits. A dozen maggots may infest the same apple, though a single one is enough to render it worthless. The maggots have been found in numerous varieties, early and late; sweet, acid, and sub-acid, extending from early in July through August, September, October, November, December, January and February. The larvæ usually leave the apples and go into the ground an inch or less and soon change to the pupa state. The pupæ are occasionally found within the fruit in windfalls and quite frequently in stored fruit. Sometimes the larvæ change on the surface of the ground, under decaying fruit. On grass ground they probably change in the debris about grass roots.

Remedies.

The Trypeta is an unusually hard insect to destroy, since the eggs are laid under the skin of apples; the larvæ spend their time within the fruit; the pupæ are safely concealed in the ground, within the shrunken skins of the larvæ; thus in all forms it is immune from the attacks of parasites. The flies do not seem to be attracted by sweetened poisonous substances and cannot be trapped. The eggs are so safely lodged underneath the skin of the apple as to be beyond the reach of poison applied by spraying, hence there is no hope in that direction. The only chance left is to destroy the larvæ and pupæ. This can best be done by destroying the fruit within which they are contained. The larvæ are found abundantly in windfalls and in decayed fruit from the cellars, and the pupæ in bins and barrels where fruit has been stored. Destroying the windfalls, and all refuse fruit, and burning the rubbish from places where fruit is stored are, then, the only reasonable and practicable methods of treatment now recognized.

DESCRIPTION OF PLATES.

PLATE I. Beneficial Insects. See p. 107.

Fig 1.—*Pimpla inquisitor,* an ichneumon parasite of the tussock moth caterpillar. *a,* parasitized caterpillar; *b,* egg of parasite; *c,* same in situ; *d,* parasite larvæ issuing; *e,* parasite cocoons—all slightly enlarged, except *b* and *c,* which are much enlarged. (After Howard. Farmer's Bulletin 99, U. S. Dept. Agr.)

Figs. 2 and 3.—Ichneumons, parasitic upon apple tree tent caterpillar.

Fig. 4.—Ichneumon parasitic upon flat-headed apple tree borer.

Fig. 5.—The 15-spotted lady bird, destructive to plant lice. *a,* larva; *b,* chrysalis; *d, e, f, g,* various forms of the perfect insect.

Fig. 6.—The twice-stabbed lady bird, destructive to the oyster-shell bark louse.

Fig. 7.—Tachina fly, parasitic on apple tree tent caterpillar.

PLATE II.

Fig. 1.—Round-headed borer (*Saperda candida*). See page 108. *a,* larva; *b,* pupa; *c,* beetle.

Fig. 2.—Flat-headed borer (*Chrysobothris femorata*). See page 109. *a,* larva; *b,* pupa; *c,* head of larva, under side; *d,* beetle.

Fig. 3.—Woolly louse. (*Schizoneura lanigera*). See page 113. *a,* excrescence upon the root; *b,* the lice at work; *c,* a louse much magnified.

Fig. 4—Pear-blight beetle or shot-borer (*Xyleborus pyri*). See page 112.

Fig. 5.—Work of the pear-blight beetle.

(Figs 4 and 5 after Howard).

PLATE III.

Fig. 1.—Oyster-shell bark louse (*Mytilaspis pomorum*). See page 110. *a,* egg; *b,* female louse; *c, d, e, f,* stages in the life history; *g,* under side of female scale,—all much magnified.

Fig. 2.—Oyster-shell bark louse. Scales in place upon the bark.

Fig. 3.—Lesser apple leaf folder, (*Teras minuta*). See page 117. *a,* larva; *b,* pupa; *c,* moth; *d,* case made on apple leaf. (After Smith).

Figs 4 and 5.—Oblique-banded leaf roller (*Cacœcia rosana*). See page 116.

Fig. 6.—Bud moth (*Tmetocera ocellana*). See page 114. (Cornell Expt. Sta., Bulletin 50).

PLATE IV.

Fig 1.—Forest tent caterpillar (*Clisiocampa disstria*). See page 118. *a*, egg clusters; *b*, moth; *c* and *d*, eggs; *e*, caterpillar.

Fig. 2.—Apple tree tent caterpillar (*Clisiocampa Americana*). See page 120. *a* and *b*, larvæ; *c*, egg cluster; *d*, pupa; *e*, male moth; *f*, female moth.

PLATE V.

Fig. 1.—Fall web worm (*Hyphantria cunea*). See page 121. Moths and cocoons—natural size. (After Howard. Farmer's Bulletin 99, U. S. Dept. Agr.)

Fig. 2.—Fall web worm. *a*, light form of full-grown larva; *b*, dark form of same; *c*, pupa; *d*, spotted form of moth (compare fig. 1), all slightly enlarged. (After Howard. Farmer's Bulletin 99, U. S. Dept. Agr.)

PLATE VI.

Fig. 1.—Lime tree winter moth (*Hybernia tillaria*). See page 123. *a*, larvæ at work; *b*, female moth; *c*, male moth.

Fig. 2.—Apple leaf bucculatrix (*Bucculatrix Pomifoliella*). See page 125. *a*, cocoons, natural size; *b*, same, enlarged; *c*, moth, enlarged.

Fig. 3.—Apple tree aphis (*Aphis mali*). See page 129. *a*, female; *b*, male; *c*, male, natural size.

Fig. 4.—Fall canker worm (*Anisopteryx pometaria*). See page 128. *a*, male moth; *b*, female moth; *d*, egg cluster.

Fig. 5.—Fall canker worm,—eggs and larva. *a* and *b*, egg, enlarged; *c*, segment of larva enlarged; *e*, egg cluster; *f*, full grown larva.

PLATE VII.

Fig. 1.—White-marked tussock moth (*Orgyia leucostigma*). See page 126. *a*, larva; *b*, female pupa; *c*, male pupa; *d*, *e*, male moth; *f*, female moth; *g*, same, ovipositing; *h*, egg mass; *i*, male cocoons; *k*, female cocoons, with moths carrying eggs—all slightly enlarged. (After Howard. Farmer's Bulletin 99, U. S. Dept. Agr.)

Fig. 2.—Codling moth (*Carpocapsa pomonella*). See page 133. *a*, fruit showing work of larva; *b*, point of entrance; *c*, larva, full grown; *d*, pupa; *f*, *g*, moth; *h*, head of larva; *i*, cocoon. (After Riley).

Fig. 3.—Plum curculio (*Conotrachelus nenuphar*). See page 134. *a*, larva; *b*, chrysalis; *c*, beetle; *d*, beetle and its work—all except *d*, enlarged.

PLATE VIII.

Fig. 1.—Apple maggot (*Trypeta pomonella*). See page 136. Mature fly (female), much enlarged.

Fig. 2.—Apple maggot. Larva much enlarged.—The short line above shows the natural size.

Fig. 3.—Apple maggot. An infested fruit.

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PLATE I.

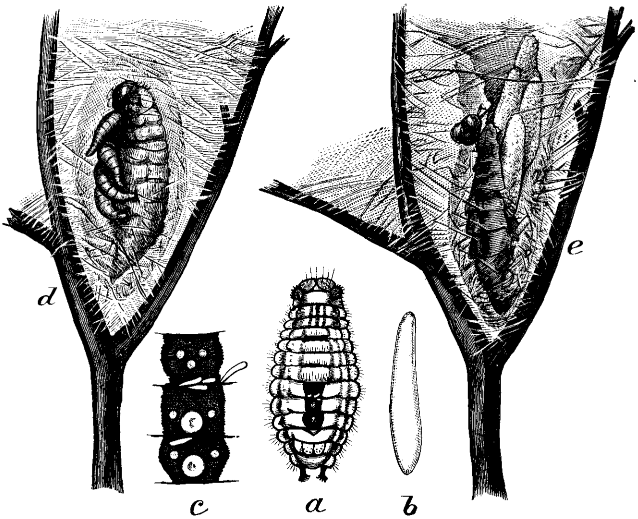
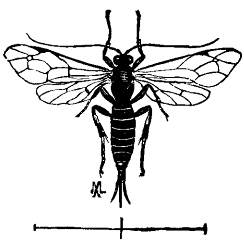


FIG. 1.



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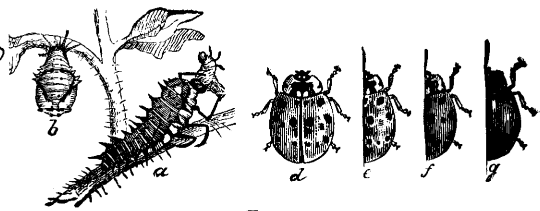

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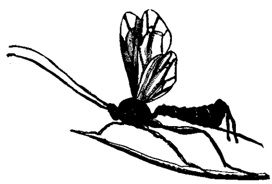

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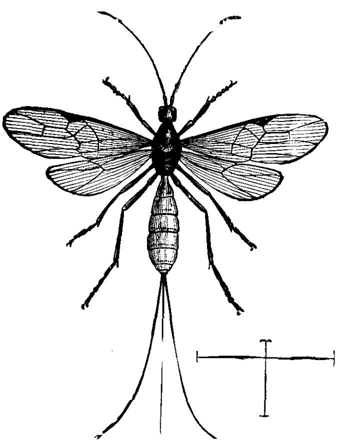

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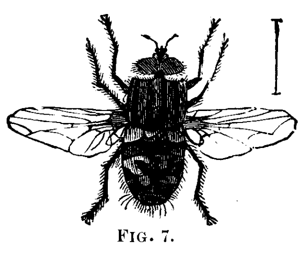

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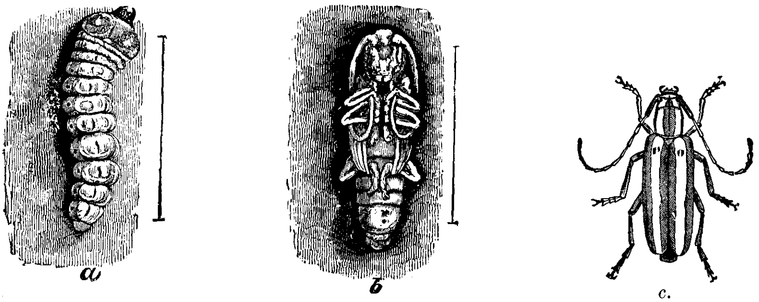

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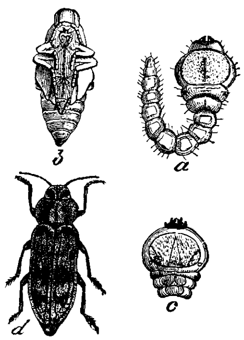

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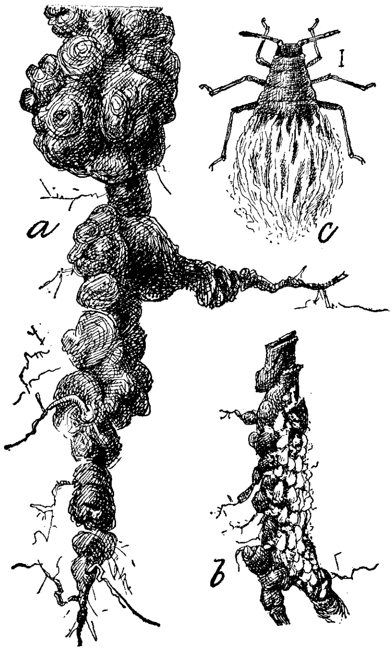

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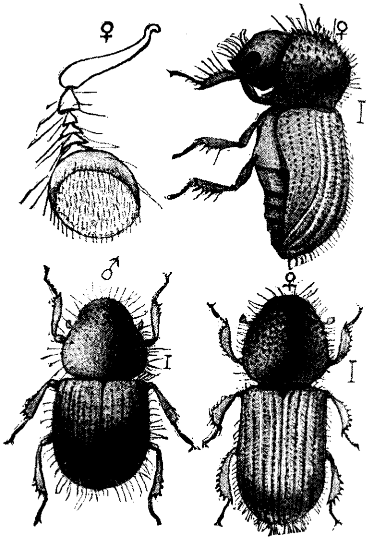

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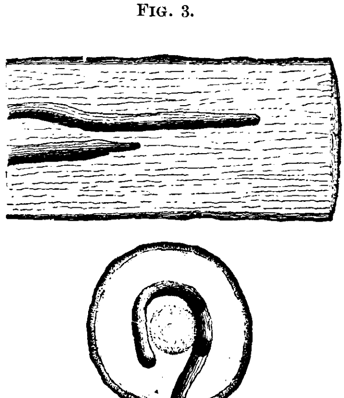

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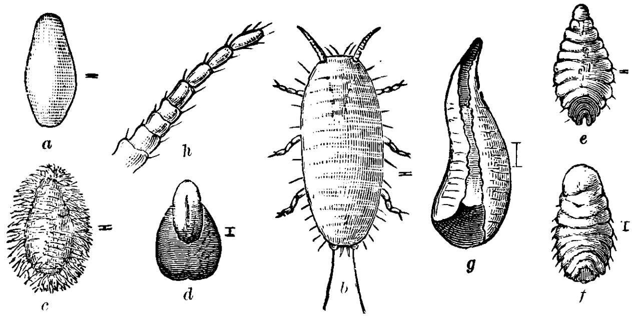

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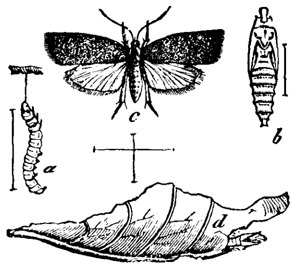

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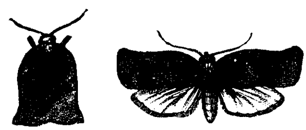

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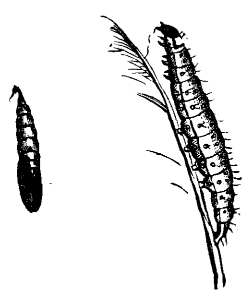

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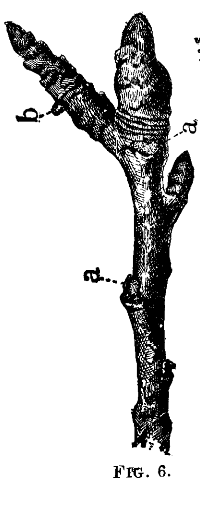

FIG. 6.

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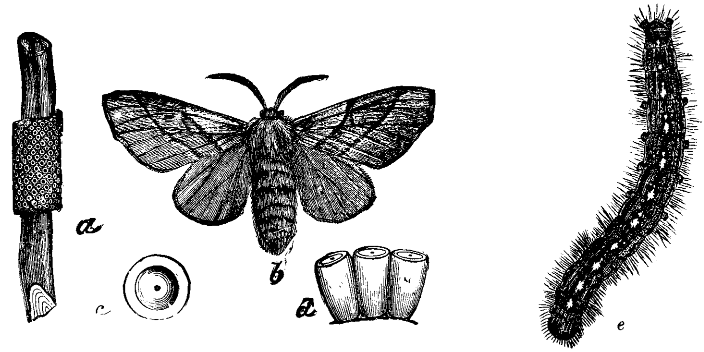

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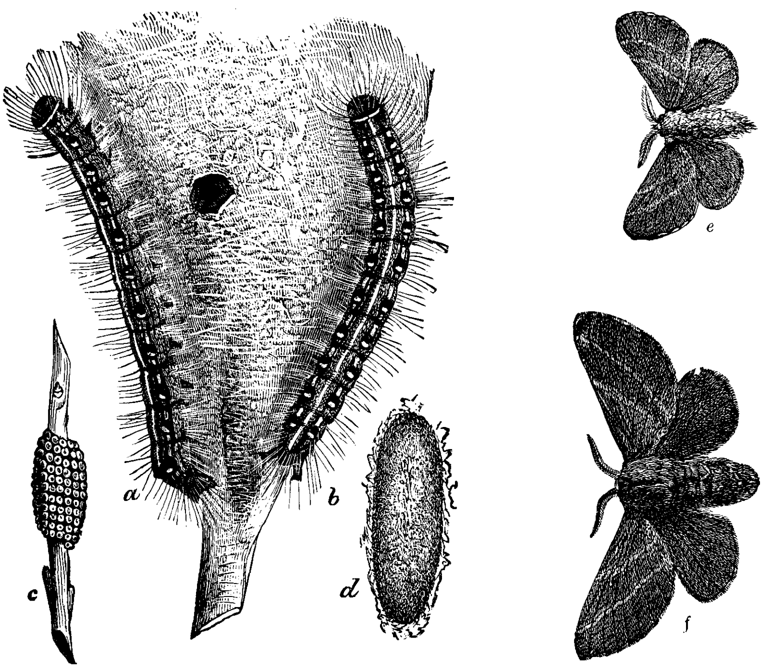


FIG. 2.

PLATE V.

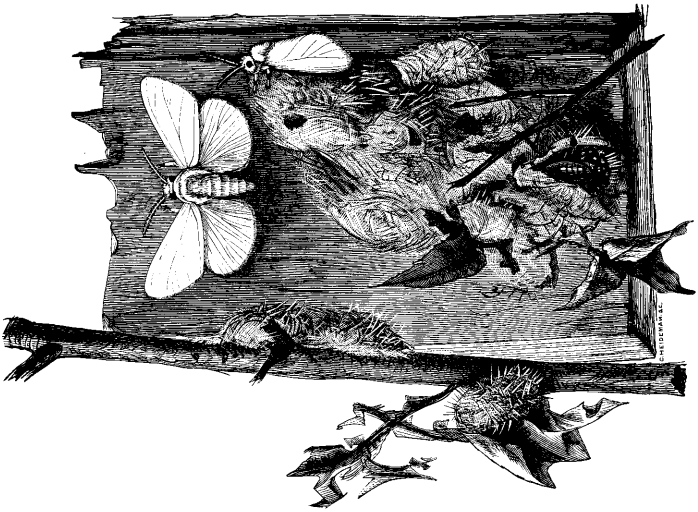


FIG. 1.

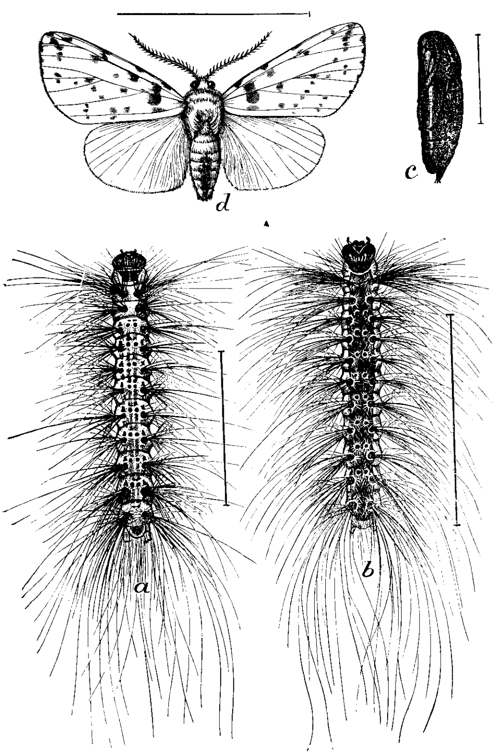


FIG. 2.

PLATE VI.

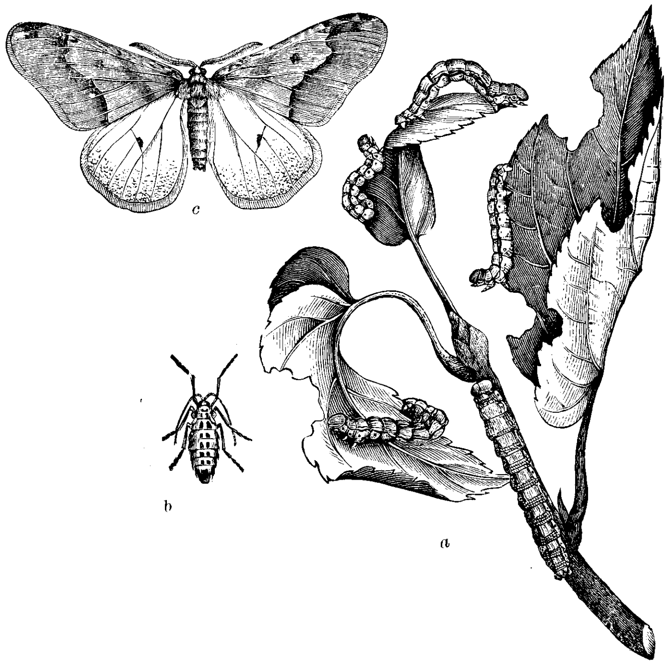
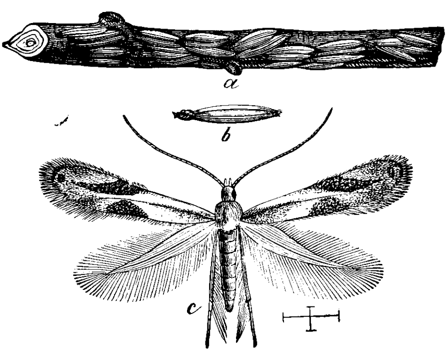


FIG. 1.



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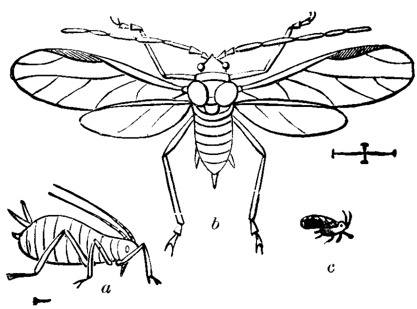

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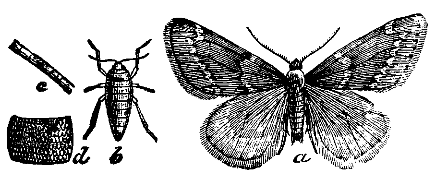

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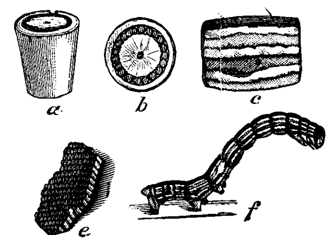


FIG. 5.

PLATE VII.

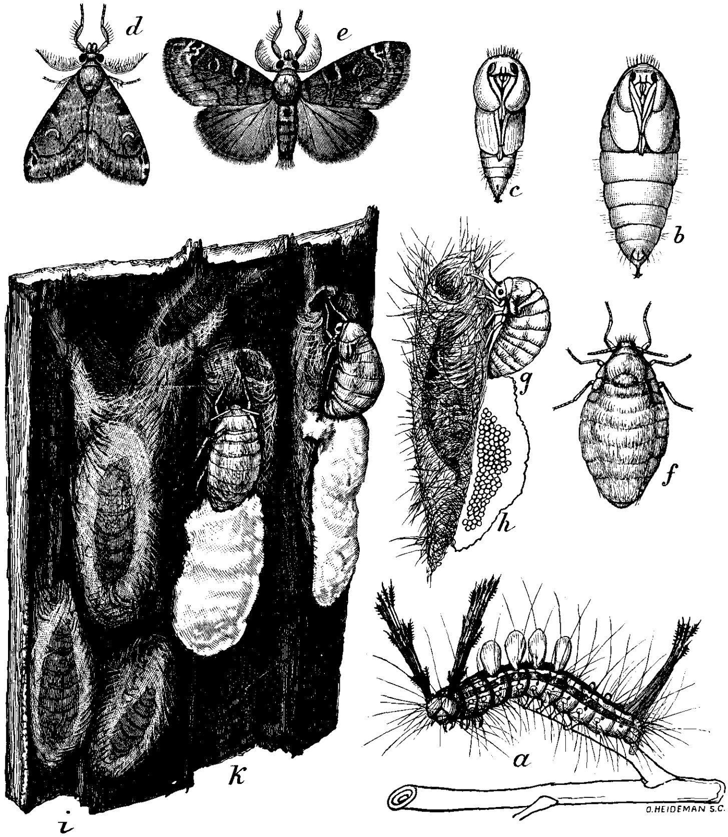
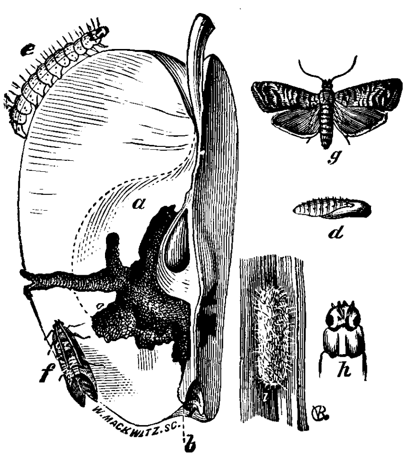


FIG. 1.



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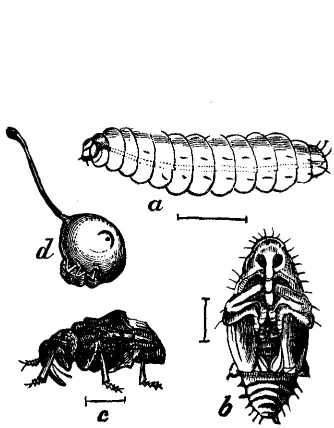
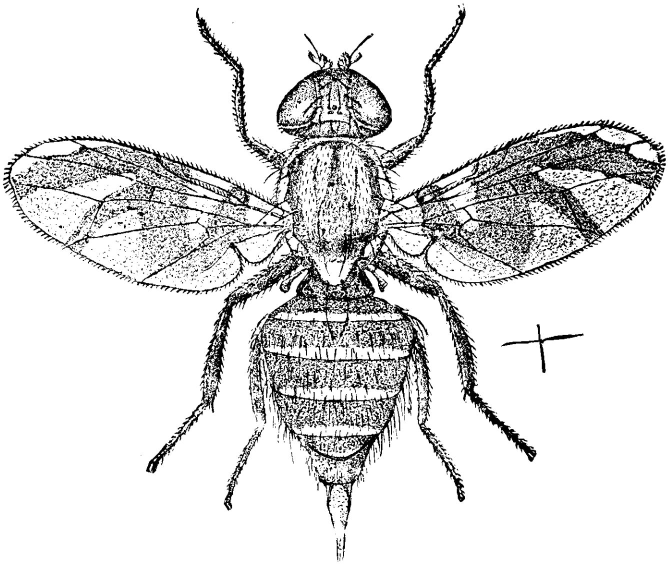


FIG. 3.

PLATE VIII.



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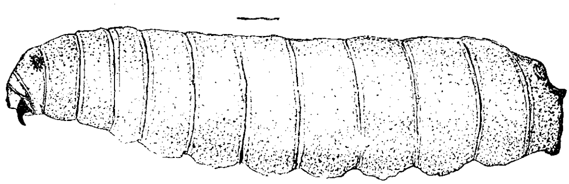

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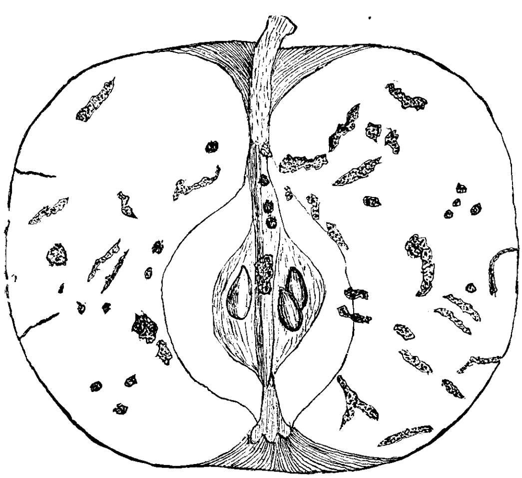

FIG. 3.

EXPERIMENTS WITH POTATOES.

Chas. D. Woods and J. M. Bartlett.

An investigation was planned for the purpose of determining the effect of spraying potato vines with Bordeaux mixture on the starch content of the tubers. As starch accumulates most rapidly when the plant is maturing, it seemed reasonable to assume that if spraying prevented blight and prolonged the life of the plant to its natural period of growth, the tubers would be of better quality with a larger proportion of starch than those from immature plants. Aroostook county being the great potato county of the State, where large starch factories are located, arrangements were made in the fall of 1898, with growers in that section to supply us with potatoes from sprayed and unsprayed fields.

The samples were selected by the growers and only merchantable potatoes were taken for analysis. About the time that we were preparing to begin the analyses, Dr. Wiley, Chief Chemist of the U. S. Department of Agriculture, visited the State to study the starch factories of Aroostook. He kindly offered to have the analyses of the potatoes made in his laboratory, and the samples were accordingly forwarded to Washington. The Department laboratory was being entirely rebuilt at that time and this occasioned so much delay in the analyses that the results were not received until the growing season was well begun and it was, therefore, deemed best to defer the publication until the present time.

The description of the samples and the results of the analyses as found by the Chemical Division of the U. S. Department of Agriculture follow:

DESCRIPTION OF POTATO SAMPLES.

No. 3036, *Beauty of Hebron.* Grown by C. H. Richardson, Fort Fairfield; sample was taken from a field of eight acres which had been in pasture since being cleared until 1896. In 1896 it bore a heavy crop of potatoes without any rust; in 1897, it was again planted to potatoes with a light yield and an early rust. The yield in 1896 was about 100 barrels per acre and in 1897 about 50 barrels. The soil is light red loam and, like most land in that vicinity, is on a shell-like lime rock ledge. The field was plowed in the fall of 1897, and harrowed three times in the spring with a spring toothed harrow. It was planted with a planter and hoed with a horse hoe. The field had received no manure until in 1896 and that year, and in 1897 and in 1898 it received about 500 pounds of complete fertilizer per acre. In 1898, the crop was planted May 19 and harvested between September 1 and 20.

The crop was sprayed twice with Bordeaux mixture, July 30 and August 9, but it was too late to save the plants from the blight. The yield was about fifty barrels of merchantable potatoes and fifteen barrels of small ones, per acre.

No. 3037, *Beauty of Hebron.* These potatoes were taken from a field adjoining that from which No. 3036 were taken. The field was plowed for the first time in the fall of 1897 and the crop was grown on the sod without the addition of any fertilizing materials.

Nos. 3038 *and* 3039, *White Elephant and* 3040 *and* 3041, *Delaware.* These samples were from T. B. Bradford, Golden Ridge, Sherman, Maine. The land had a slope to the north; had been in grass until October, 1897, when it was plowed. The soil was dark soil, inclined to be wet, and was not underdrained. The sub-soil was gravelly. It received about ten two-horse loads of barn manure, broadcast, over the field and about 500 pounds of fertilizer per acre; the fertilizer was applied in the drill. The field was planted June 1 and harvested September 28. The whole field was sprayed three times with Bordeaux mixture by the use of an Aspinwall Sprayer; in addition to this, sample No. 3038 was sprayed more with a knapsack sprayer. At the time that had been sprayed five times, the others were killed by rust. There were forty-five barrels of merchantable potatoes and seventy-five barrels of small potatoes per acre. All of the potatoes rotted very badly, and the decay began before any of the leaves were killed.

Nos. 3044 *and* 3045, *White Elephant.* These samples were received without the name of the sender. Three thousand forty-four was not sprayed and 3045 was sprayed with Bordeaux mixture.

Nos. 3046 *and* 3047, *White Elephant.* These were grown by R. S. Hoyt of Fort Fairfield. The field has a slope to the northeast and was in pasture previous to 1896. In 1897, a crop of potatoes was grown with the addition of 300 pounds of fertilizer. The yield was about sixty barrels. The field was plowed again in October, 1897, harrowed May 20, 1898, planted May 24 and harvested September 21. Four hundred pounds of complete fertilizer were used, applied in the drill. The part from which No. 3046 was taken, was sprayed twice, and 3047 was not sprayed. The yield was sixty-five barrels of merchantable potatoes and twenty-five barrels of small potatoes per acre.

Nos. 3050 *and* 3051, *White Elephant.* Grown by Powers Bros. of Caribou. The field bore potatoes in 1895; was seeded to oats in 1896 and grew a crop of red clover in 1897. The soil is a medium light clay loam with a gravelly sub-soil. The field was plowed in October, 1897, and harrowed in the spring. Four hundred pounds commercial fertilizer was applied in the drill, and the piece was planted May 15-19 and harvested September 20-25. The field was sprayed three times but finally succumbed to the blight. The yield was sixty barrels of merchantable potatoes and thirteen barrels of small ones per acre. Number 3051 was from an unsprayed portion of the field.

Nos. 3052 *and* 3053, *Delawares.* The name of the sender and the culture is not known, except that 3052 was sprayed with Bordeaux mixture and 3053 was unsprayed.

Nos. 3054 *and* 3055, *Carmen.* These were from the same person as 3052 and 3053. No. 3054 was sprayed with Bordeaux mixture and 3055 was unsprayed.

ANALYSIS OF POTATOES GROWN IN 1898, THE RESULTS CALCULATED TO WATER CONTENT AT TIME OF SAMPLING.*

Variety.	Laboratory No.	Water.	Starch.	Fiber.	Protein nitrogen X 6.25.	Ash.	Total.	Specific gravity.
		%	%	%	%	%	%	
Hebron	3036	79.72	16.94	0.90	2.12	0 76	100.44	1.0604
Hebron	3037	78.13	18.59	0.72	2.06	0.78	100.28	1.0795
White Elephant.. ...	3038	76.81	19.96	0.84	2.19	0.99	100.79	1.0867
White Elephant......	3039	76.92	20.38	0.90	2.31	0.87	101.38	1.0742
White Elephant......	3044	78.74	15.96	0.64	2.25	0.92	98.51	1.0803
White Elephant......	3045	75.21	19.31	0.61	2.12	0.83	98.02	1.1058
White Elephant......	3046	75.88	18.81	0.56	2.25	0.96	98.46	1.0921
White Elephant.. ...	3047	77.44	18.12	0.63	2.06	0.88	99.13	1.0906
White Elephant......	3050	75.56	18.14	0.56	1.81	1.04	97.11	1.1129
White Elephant.. ...	3051	78.13	18.62	0.63	1.75	0.98	100.11	1.0881
Delaware	3040	76.02	19.20	0.61	2.06	1.01	98.90	1.0852
Delaware	3041	76.93	18.63	0.61	2.19	0.94	99.30	1.0904
Delaware	3052	75.72	18.63	0.55	2.31	0.95	98.16	1.0745
Delaware	3053	77.64	16.26	0.61	2.56	0.91	97.98	1.1120
Carmen	3054	76.87	18.03	0.66	2.06	0.90	98.52	1.0967
Carmen	3055	76.57	17.07	0.59	2.38	0.76	97.37	1.0804

*The analyses were made by the Chemical Division of the U. S. Department of Agriculture.

As these results are not given in the usual form of food analyses, they are presented in that form on both the fresh and water free basis in the tables which follow. As the fat was not determined, it is included with the carbohydrates. It will be seen that the starch as determined, as given in the table on page 147, exceeds in several instances, the combined carbohydrates and fat, as given on page 149. These discrepancies are due to the fact that the analytical methods have in several cases given too high results, carrying the total above 100 per cent, while in the second table, the carbohydrates and fat are calculated by difference. The average of 136 analyses, as compiled in Bulletin 28 of the Office of Experiment Stations of the United States Department of Agriculture, is added for comparison:

ANALYSES OF POTATOES.

RESULTS CALCULATED TO WATER-FREE BASIS.

Variety.	Laboratory number.	Ash.	Protein.	Fiber.	Carbohydrates and fat.
		%	%	%	%
Hebron	3036	3.75	10.45	4.44	81.36
Hebron	3037	3.57	9.42	3.29	83.72
Average	....	3.66	9.94	3.86	82.54
White Elephant	3038	4.27	9.44	3.62	82.67
White Elephant	3039	3.77	10.01	3.90	82.32
White Elephant	3044	4.33	10.58	3.01	82.08
White Elephant	3045	3.35	8.55	2.46	85.64
White Elephant	3046	3.98	9.33	2.32	84.37
White Elephant	3047	3.90	9.13	2.79	84.18
White Elephant	3050	4.26	7.41	2.29	86.04
White Elephant	3051	4.48	8.00	2.88	84.64
Average	....	4.04	9.06	2.91	83.99
Delaware	3040	4.21	8.59	2.54	84.66
Delaware	3041	4.07	9.49	2.65	83.79
Delaware	3052	3.91	9.51	2.27	84.31
Delaware	3053	4.07	11.45	2.73	81.75
Average	....	4.06	9.76	2.55	83.63
Carmen	3054	3.89	8.91	2.85	84.35
Carmen	3055	3.24	10.16	2.52	84.08
Average	....	3.57	9.53	2.69	84.21
Average of 136 samples*	....	4.61	10.14	1.84	83.41

* Bulletin 28 of the Office of Experiment Stations.

ANALYSES OF POTATOES.

RESULTS CALCULATED TO WATER CONTENT AT TIME OF SAMPLING.

Variety.	Laboratory No.	Water.	Ash.	Protein.	Fiber.	Carbohydrates and fat.
		%	%	%	%	%
Hebron............	3036	79.72	.76	2.12	.90	16.50
Hebron.....................	3037	78.13	.78	2.06	.72	18.31
Average...............	....	78.92	.77	2.09	.81	17.41
White Elephant	3038	76.81	.99	2.19	.84	19.17
White Elephant	3039	76.92	.87	2.31	.90	19.00
White Elephant	3044	78.74	.92	2.25	.64	17.45
White Elephant	3045	75.21	83	2.12	.61	21.23
White Elephant	3046	75.88	.96	2.25	.56	20.35
White Elephant	3047	77.44	.88	2.06	.63	18.99
White Elephant	3050	75.56	1.04	1.81	.56	21.03
White Elephant	3051	78.13	.98	1.75	.63	18.51
Average	....	76.84	.93	2.09	.67	19.47
Delaware................ ..	3040	76.02	1.01	2.06	.61	20.30
Delaware.	3041	76.93	.94	2.19	.61	19.33
Delaware.	3052	75.72	.95	2.31	.55	20.47
Delaware..................	3053	77.64	.91	2.56	.61	18.28
Average....	....	76.58	.95	2.28	.60	19.59
Carmen....................	3054	76.87	.90	2.06	.66	19.51
Carmen......................	3055	76.57	.76	2.38	.59	19.70
Average	.. ..	76.72	.83	2.22	.63	19.60
Average of 136 analyses*..	....	78.30	1.00	2.20	.40	18.10

* Bulletin 28 of the Office of Experiment Stations.

ANALYSES OF THE ASH OF POTATOES.

In four samples large quantities of the ash were obtained for analysis. These analyses were also made by the Chemical Division of the United States Department of Agriculture. The results follow:

PERCENTAGES OF IMPURITIES (CARBON, SAND AND SILICA) AND PURE ASH IN THE CRUDE ASH.

Sample number.	Impurities.	Pure Ash.
	%	%
3045	9.36	90.64
3047	12.32	87.68
3050	5.14	94.86
3051	7.04	92.96

ANALYSIS OF PURE ASH OF POTATOES.

Sample number.	Potash, K_2O.	Soda, Na_2O.	Lime, CaO.	Magnesia, MgO.	Phosphoric acid, P_2O_5.	Sulphuric acid, SO_3.
	%	%	%	%	%	%
3045	55.13	1.70	1.01	3.85	15.78	6.92
3047	56.16	1.62	1.38	3.93	14.50	5.98
3050	56.43	1.70	1.29	3.76	15.00	6.38
3051	57.30	2.15	1.05	3.57	13.33	5.56

RELATION BETWEEN STARCH CONTENT AND SPECIFIC GRAVITY.

The specific gravity of starch is 1.65, water being taken as one. From this it would seem to follow that the richer a potato is in starch, the higher will be its specific gravity. From this assumption, a German agricultural calendar* has for years published a table giving the starch content of potatoes corresponding to various specific gravities. Assuming this method to be reliable, one of the best experiment stations in the United States has made an otherwise valuable investigation of little account. In Wiley's Principles and Practice of Agricultural Analysis, the unreliability of this method for scientific purposes is pointed out. The figures obtained in the analyses here reported, show in a striking manner the unreliability of the specific gravity method of determining starch in potatoes. In only one instance, (No. 3045) is there a practical agreement between the starch deter-

* Mentzel und v. Lengerke's Landw. Huelfs und Schreib-Kalender.

mined chemically and that found by the specific gravity method. Number 3036 has the lowest specific gravity of any of the samples examined, and 3053 has the next to the highest. Number 3036 carries 16.94 per cent while 3053 has only 16.26 per cent. As found by specific gravity, 3036 would have only ten per cent of starch and 3053 would have over twenty per cent. In the table which follows the samples are arranged according to their specific gravities.

TABLE SHOWING ABSENCE OF RELATION BETWEEN SPECIFIC GRAVITY AND STARCH CONTENT OF POTATOES.

Sample number.	Specific gravity.	Starch by specific gravity.	Starch directly determined.
		%	%
3036	1.0604	10.1	16.94
3039	1.0742	12.7	20.38
3052	1.0745	12.9	18.63
3037	1.0795	13.8	18.59
3044	1.0803	13.9	15.96
3055	1.0804	13.9	17.07
3040	1.0852	15.0	19.20
3038	1.0867	15.3	19.96
3051	1.0881	15.6	18.62
3041	1.0904	16.1	18.63
3047	1.0906	16.2	18.12
3046	1.0921	16.4	18.81
3054	1.0967	17.5	18.03
3045	1.1058	19.4	19.31
3053	1.1120	20.7	16.26
3050	1.1129	20.9	18.14

EFFECT OF SPRAYING UPON THE STARCH CONTENT OF POTATOES.

As before stated, this investigation was begun with the express purpose of studying the effect of spraying upon the starch content of the potatoes. Owing to the fact that in most instances the spraying was begun so late that none of the potatoes here sampled completely escaped the attack of the blight, it was thought that very little, if any, difference would be found between the starch content of potatoes whose vines were sprayed with Bordeaux mixture and those unsprayed. Theoretically, anything which prolongs the growing season ought to increase the amount of starch which will be stored up in the potato; hence, if vines sprayed with Bordeaux mixture live longer than those not treated, not only should the yield of potatoes be larger, but the percentage of starch should be higher.

PERCENTAGES OF STARCH IN SPRAYED AND UNSPRAYED POTATOES.

Variety of potatoes.	Sprayed.		Unsprayed.	
	Sample No.	Starch.	Sample No.	Starch.
		%		%
White Elephant	3038	19.96	......	....
	3039	20.38	....	....
	3045	19.31	3044	15.96
	3046	18.81	3047	18.12
	3050	18.14	3051	18.62
Average	......	19.32	......	17.52
Delaware	3040	19.20	3041	18.63
	3052	18.63	3053	16.26
Average	....	18.92	....	17.45
Carmen No. 1	3054	18.03	3055	17.07
Average of all	....	19.06	....	17.43

In the case of the Hebron potatoes, the unsprayed had a larger starch content than the sprayed. From the description of the samples, it will be noted that the field from which the sprayed potatoes were taken had been planted to this crop for three years, while the unsprayed was on sod, and that the growing time of the plants was not prolonged by the spraying. In the other instances, spraying seemed to increase the percentage of starch in the tubers. The four samples of White Elephant potatoes which had been sprayed, contained 19.3 per cent of starch, while the three samples of the same variety unsprayed had on the average only 17.5 per cent. The two samples of sprayed Delawares had 18.9 per cent and the unsprayed 17.4 per cent of starch, and the one sample of sprayed Carmen had 18.0 per cent against 17.1 per cent for the unsprayed. So far as these cases go, they seem to indicate that spraying with Bordeaux mixture not only prolonged the life of the vines, but that sprayed potatoes contained higher percentages of starch than unsprayed.

The results of a single experiment at Kalmaes Agricultural College, Norway, gave results indicating a very beneficial influence from Bordeaux mixture, both in yield and in starch content of the potatoes grown. The condensed results were as follows:*

	Yield per acre.	Starch content.
	Lbs.	%
Potatoes not treated with Bordeaux mixture	1,426	13.9
Potatoes treated once with Bordeaux mixture	2,116	14.3
Potatoes treated twice with Bordeaux mixture	2,858	16.3

THE STARCH CONTENT OF AROOSTOOK GROWN POTATOES COMPARED WITH THAT OF POTATOES GROWN ELSEWHERE.

The sixteen samples here reported upon were found to carry an average of 18.29 per cent of starch. The percentages ranged from 15.96 to 20.38 per cent. Two of the samples carried about 16 per cent, two about 17, two about 19 and two about 20 per cent. The other samples had about 18 per cent. The eight sprayed samples had an average of 19.06 per cent and the unsprayed had an average of 17.43 per cent of starch. It is probable that the crop of 1898 did not average much above that of the unsprayed samples here reported upon.

In 1890, the Utah Experiment Station† made sixteen analyses of potatoes in which the starch ran abnormally high. In 1894 and 1895, the same station made about seventy-five analyses in which the starch content varied from a minimum of 10.17 per cent to a maximum of 22.49, with an average of about 17 per cent.

The analyses of something over 200 samples of potatoes by the West Virginia Experiment Station‡ show a range in starch from 13.46 per cent to 21.43 per cent. Only four of the samples

* Experiment Station Record, Vol. 8, p. 122.
† Report of Utah Experiment Station for 1896, pp. 21 to 25.
‡ Report of West Virginia Experiment Station, 1896, pp 50-57.

contained twenty per cent or above of starch and fourteen had less than fifteen per cent. The greater number of the samples carried between 15.50 and 17.50 per cent. The average was 16.50 per cent.

In fifteen samples of Norwegian grown potatoes,* the starch ranged from 12.3 to 20.3 per cent with an average of 14.91 per cent. In still another lot of Norwegian potatoes† consisting of 122 samples, 20 samples contained less than 13.19 per cent of starch, 22 samples contained less than 14.15 per cent, 38 samples contained less than 15.06 per cent of starch and 42 samples had over 17 per cent. The highest percentage found was 20.59 per cent.

The average of 20 samples examined by the Halle (Germany) Experiment Station was 19.77 per cent of starch with a range from 17.72 to 22.78 per cent.

From the above comparisons it is evident that the potatoes which were sprayed were full higher in starch than most others which have been examined. If the per cent and a half more of starch found in the sprayed than in the unsprayed potatoes was due to the treatment of the vines, and no other explanation suggests itself, this alone is a strong argument in favor of spraying.

FERTILIZING MATERIALS REMOVED BY A CROP OF POTATOES.

Ash analyses of four samples of the potatoes are given on page 150. These results, calculated to the fresh potato, are given in the table which follows:

FERTILIZING CONSTITUENTS OF POTATOES CALCULATED TO WATER CONTENT OF FRESH POTATOES.

Variety.	Laboratory number.	Nitrogen.	Phosphoric acid.	Potash.	Lime.
		%	%	%	%
White Elephant	3045	.34	.12	.41	.01
White Elephant	3047	.33	.11	.43	.01
White Elephant	3050	.29	.15	.56	.01
White Elephant	3051	.28	.12	.52	.01
Average	....	.31	.13	.48	.01

* Experiment Station Record, Vol. 6, p. 410.
† Experiment Station Record, Vol. 5, p. 1017.

In the Year Book of the United States Department of Agriculture for 1896, are given figures which agree very closely with the above. These are compiled results and from the close agreement it would seem to indicate that the composition of potatoes, so far as nitrogen, phosphoric acid and potash are concerned, is fairly uniform.

Assuming these figures to fairly represent potatoes as grown in Maine, a crop of 200 bushels, weighing six tons, would remove thirty-seven pounds of nitrogen, sixteen pounds of phosphoric acid and fifty-eight pounds of potash.

If the amounts and proportions of fertilizing elements removed by a crop could be taken as a guide in preparing a field for that crop, the problem of supplying the proper amount and kind of plant food to the soil would be much simplified. To manure a field for a crop of potatoes, nitrogen, phosphoric acid and potash would have to be added in about the proportions given above and in sufficient quantity to supply the vines and tubers the land was expected to yield. A formula made up on this basis would be very materially different from any mixed fertilizer on the market and would contain the fertilizing elements in about the following proportions: Nitrogen, 5 parts; phosphoric acid, 2 parts; and potash, 8 parts. Twenty-six different brands of so-called potato fertilizers were sold in the State in 1899. The table which follows show how these goods were made up:

COMPOSITION OF SO-CALLED POTATO FERTILIZERS SOLD IN MAINE IN 1899.

	Nitrogen.	Available phosphoric acid.	Potash.
	%	%	%
12 brands	1.5—2.5	8—9	2 3.25
6 brands	2—2.5	6—9	4—6
8 brands	2.5—3.5	5.5—8	7—10

The first twelve brands mentioned cannot properly be called potato or special fertilizers as their composition is practically the same as all general purpose goods. The formulas of the last eight, approximate more nearly to the popular idea of what a potato manure should be, but even these carry much more phosphoric acid in proportion to the nitrogen and potash they contain than is found in the plants or in farmyard manure.

It is possible that in using commercial fertilizers, more phosphoric acid is applied than is needed in many cases, yet there is not much evidence at hand in the form of accurate experimental data to prove this assertion. Many experiments have been made both in this country and Europe in growing potatoes with commercial fertilizers and chemicals, but very few experimenters have made a study of the relative proportions of the fertilizing elements that can be most profitably used.

L. Hecke* in his quite extensive experiments with chemicals on the potato plant found that it needed, throughout its entire period of growth, liberal supplies of all fertilizing elements. The demand for nitrogen was especially strong in the first half, and for potash in the last half of the season. The application of potash had a marked influence on the production of tubers and starch. Phosphoric acid had less effect, probably because the soil was quite rich in phosphates.

Experiments are reported by the New York Experiment Station,,† in which the primary object was to determine the profitable amount of fertilizer to apply. Two formulas were used, one of which carried approximately nitrogen 4%, phosphoric acid 8.2%, potash 10%; the other, nitrogen 6.5%, phosphoric acid 4.8%, potash 10%. The quantities applied were the same for each formula, being 500, 1,000, 1,500 and 2,000 pounds per acre. One thousand pounds per acre of either kind yielded the largest profit, but the one carrying the most phosphoric acid gave the largest yields in every case; the greatest difference occurring when but 500 pounds were used, and least when 2,000 pounds were applied per acre. As the mixture high in phosphoric acid cost several dollars per ton less, on account of containing less nitrogen, it was more profitable than the other.

Experiments were made at the Kentucky Experiment Station‡ on a limestone soil quite rich in phosphoric acid, in growing potatoes with chemicals. The best yield was obtained when the three elements, nitrogen, phosphoric acid, and potash were used.

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* Jour. Landw. 43 (1895) p. 285.
† Bulletin 137, 1897.
‡ Bulletin 55.

Much better crops were obtained when phosphoric acid and potash were used than when potash was used alone or with nitrogen only. The chemicals were added in the proportion of nitrogen 25.6 pounds, phosphoric acid 57 pounds and potash 80 pounds per acre, or if mixed, the composition would be nitrogen 5.5%, phosphoric acid 12.4%, potash 17%.

The Connecticut Experiment Station* made experiments to compare the effect of muriate with that of sulphate of potash on the starch content and yield of tubers. The potatoes were grown on very poor soil which was dressed with 400 pounds nitrate soda, 615 pounds acid phosphate and 120 pounds of muriate or sulphate of potash. The yield was increased from 43 to 228 bushels of salable tubers per acre. Doubling the potash, applying 240 pounds per acre, increased the yield only twelve bushels per acre over what was produced when 120 pounds were applied. Muriate produced a somewhat greater yield than sulphate, but the tubers contained slightly more water and less starch than when sulphate was used.

The evidence in regard to the relative effect of sulphate and muriate of potash on potatoes is somewhat conflicting. Most of the experiments made in this country and Europe show that sulphate produces better tubers with less water and a slightly higher starch content, but the difference is slight. Some German experimenters, Pfeiffer† and others, have recently published results of experiments showing that pure muriate has no injurious effect on the tubers, but impurities, noticeably chloride of magnesia, are influential in depressing the proportion of starch.

An analysis of the ash of the potato shows it to be exceedingly rich in potash, and the fact has led many to believe that a potato manure should contain a large amount of this element, but when we consider the small amount of ash a potato contains, we find the amount removed by an ordinary crop (58 pounds) is not greater than is taken up by any other farm crops. Two tons of mixed hay would take away sixty-three pounds, while two tons of red clover would take eighty-eight pounds of potash.

In preparing a field for any crop it is more essential to consider the special needs of the soil, to render it fertile, than the special

* Report 1895, p. 124.

† Die Land. Vers. Stat. Bd. 49, p. 49.

needs of the crop to be grown upon it. While it is true that some plants take up more of some one element than others, the difference is insignificant when compared with the difference in soils. The soils of Maine are extremely variable in character and composition and it is therefore impracticable to make a fertilizer formula for potatoes or any other crop that would be applicable in all cases. Each farmer who uses commercial fertilizers extensively should experiment with unmixed goods enough to determine to what elements his soil most readily and profitably responds. Some marl or limestone soils are quite rich in phosphoric acid and consequently a fertilizer containing a small amount of that element and relatively large amounts of nitrogen and potash would give best results, while some of our granite soils and clay loams are quite rich in potash and respond best to a fertilizer containing relatively large amount of phosphoric acid.

A study of the experimental data indicates that the potato plant thrives best in a rich soil which is abundantly supplied with all fertilizing elements. In the early stages of its growth, when the vines are forming, the demand for nitrogen is particularly large, and for this reason a potato fertilizer should contain quite a part of its nitrogen in a soluble, immediately available form. Later in the season, when the tubers are forming, large amounts of phosphoric acid and potash are required, also a bountiful supply of water to take up the plant food, etc., and transmit it through the vines.

ACKNOWLEDGMENTS.

Acknowledgment is hereby made for the following gifts to the Station during 1899:

Set Economic Seeds, Seed Potatoes—United States Department of Agriculture.

Apple Cions—Jules Lagace, Van Buren.

Kerowater Spraying Apparatus—Gould's Manufacturing Co., Seneca Falls, N. Y.

Copper Electric Sprayer—A. L. & E. F. Goss, Lewiston.

Spray Pump—Deming Co., Salem, Ohio.

Spray Pump—Morrell & Morley, Benton Harbor, Mich.

Paragrene—F. L. Lavenburg, New York City.

Green Arsenite, Green Arsenoid, Pink Arsenoid—Adler Color and Chemical Works, N. Y.

Prepared Bordeaux Mixture and Bordeaux Paint—Lennox Spraying Co., Pittsfield, Mass.

Special Laurel Green—Nichols Chemical Company, N. Y.

Sulphate, Muriate and Carbonate of Potash, and Kainit—German Kali Works, New York City.

Guano and Bone—Bowker Fertilizing Co., Boston, Mass.

Low Farm Wagon—Electric Wheel Co., Quincy, Ill.

Reliable Nest Box—M. L. Newell, Denver, Colo.

Calf Dehorner—Bullock Manufacturing Co., Flint, Mich.

Scythes—Nolin Manufacturing Co., Skowhegan.

Ground Oyster Shells—Poultry and Farm Supply Co., Boston.

The following newspapers and other publications are kindly donated to the Station by the publishers:

Agricultural Epitomist, Indianapolis, Ind.

Agricultural Gazette, Sidney, New South Wales.

American Cultivator, Boston, Mass.

American Fertilizer, Philadelphia, Pa.

American Florist, Chicago, Ill.

American Gardening, New York City.

American Grange Bulletin, Cincinnati, O.

American Grocer, New York City.
American Miller, Chicago, Ill.
Baltimore Weekly Sun, Baltimore, Md.
Bangor Weekly Commercial, Bangor, Me.
Breeders' Journal, Himrods, N. Y.
Canadian Horticulturist, Grimsby, Ont.
Chronique Agricole, Lausanne, Switzerland.
Country Gentleman, Albany, N. Y.
Dairy World, Chicago, Ill.
Detroit Free Press, Detroit, Mich.
Elgin Dairy Report, Elgin, Ill.
Farm, Furnace and Factory, Roanoke, Va.
Farmer's Advocate, Burlington, Vt.
Farmer's Advocate, London, Ont.
Farmer's Guide, Huntington, Ind.
Farmer's Home, Dayton, O.
Farm Home, Springfield, Ill.
Farmers' Tribune, Des Moines, Iowa.
Farm and Home, Chicago, Ill.
Farm Journal, Philadelphia, Pa.
Farm-Poultry, Boston, Mass.
Farmer's Magazine, Springfield, Ill.
Farmer's Review, Chicago, Ill.
Farmer's Voice, Chicago, Ill.
Farming, Dayton, O.
Florists Exchange, New York City.
Forester, Princeton, N. J.
Fruit, Dunkirk, N. Y.
Green's Fruit Grower, Rochester, N. Y.
Hoard's Dairyman, Ft. Atkinson, Wis.
Holstein Friesian Register, Brattleboro, Vt.
Homestead, Des Moines, Iowa.
Horticultural Visitor, Kinmundy, Ill.
Jersey Bulletin, Indianapolis, Ind.
Journal of the Royal Agricultural Society, London, England.
Louisiana Planter, New Orleans, La.
Lewiston Weekly Journal, Lewiston, Maine.
Maine Farmer, Augusta, Me.
Mark Lane's Express, London, England.
Market Basket, Philadelphia, Pa.

Market Garden, Minneapolis, Minn.
Massachusetts Ploughman, Boston, Mass.
Michigan Fruit Grower, Grand Rapids, Mich.
Mirror & Farmer, Manchester, N. H.
Montana Fruit Grower, Missoula, Mont.
National Farmer and Stock Grower, National Stock Yards, Ill.
National Rural and Family Magazine, Chicago, Ill.
New England Farmer, Boston, Mass.
New England Florist, Boston, Mass.
New England Homestead, Springfield, Mass.
New York Farmer, Port Jervis, N. Y.
New York Produce Review, New York City.
North American Horticulturist, Monroe, Mich.
Northern Leader, Fort Fairfield, Me.
Northwestern Miller, Minneapolis, Minn.
Ohio Farmer, Cleveland, Ohio.
Oregon Agriculturist, Portland, Oregon.
Pacific Bee, Sacramento, Cal.
Pacific Coast Dairyman, Tacoma, Wash.
Park and Cemetery, Chicago, Ill.
Practical Farmer, Philadelphia, Pa.
Public Ledger, Philadelphia, Pa.
Ruralist, Gluckheim, Md.
Rural Californian, Los Angeles, Cal.
Rural New Yorker, New York City.
Rural Topics, Morgan City, La.
Southern Farm Magazine, Baltimore, Md.
Southern Farmer, New Orleans, La.
Southern Planter, Richmond, Va.
Southwest, Springfield, Mo.
Southwestern Farmer, Wichita, Kans.
Strawberry Specialist, Kittrell, N. C.
Sugar Beet, Philadelphia, Pa.
Turf, Farm and Home, Waterville, Me.
Vick's Magazine, Rochester, N. Y.
Weekly Union, Manchester, N. H.
Western Agriculturist, Chicago, Ill.
Western Creamery, San Francisco, Cal.
Western Fruit Grower, St. Joseph, Mo.
The World, Vancouver, B. C.

METEOROLOGICAL OBSERVATIONS.

The instruments used at this Station are the same as those used in preceding years, and include: Wet and dry bulb thermometers; maximum and minimum thermometers; thermograph; rain-gauge; self-recording anemometer; vane and barometer. The observations at Orono now form an almost unbroken record of thirty-one years.

The noticeable features of the year at this point were the warm month of December, which was 7.33 degrees warmer than the average; and the small rainfall of April, August, and November. In August the only rain which fell was in the form of light showers, the precipitation in each case being less than one-hundredth of an inch. The total rainfall for the year was 10.66 inches below the average for thirty-one years.

For the first nine months of the year, observations were made at 7 A. M., 2 P. M., and 9 P. M. Since October 1 the morning and evening observations have been discontinued. Latitude 44°, 54′, 2″ N. Longitude 68°, 40′, 11″ W. Elevation above the sea, 150 feet.

METEOROLOGICAL SUMMARY FOR 1899.

Observations Made at the Maine Experiment Station.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean.	Total.
Highest barometer	30.58	30.28	30.60	30.16	30.13	30.15	30.11	30.18	30.32	30.36	30.31	30.37	30.30	.....
Lowest barometer	29.05	29.03	28.68	29.28	29.44	29.48	29.44	29.60	29.39	29.52	29.40	29.03	29.28	.....
Mean barometer	29.86	29.75	29.77	29.83	29.84	29.78	29.75	29.84	29.88	30.04	29.80	29.84	29.83	.....
Highest temperature	49°	52°	51°	84°	80°	87°	91°	93°	88°	76°	58°	57°	....	.....
Lowest temperature	—21°	—16°	—3°	18°	26°	37°	41°	40°	23°	22°	8°	—9°	....	.....
Mean temperature	15°.95	16°.52	26°.47	43°.32	52°.27	62°.05	68°.40	66°.48	56°.59	49°.97	33°.99	28°.04	43°.34	.....
Mean temperature for 31 years	15°.98	19°.24	27°.56	40°.26	52°.38	61°.98	66°.97	65°.05	57°.02	45°.81	34°.21	20°.71	42°.26	.....
Total precipitation in inches	2.75	2.27	4.76	.66	4.12	4.10	4.49	trace.	3.20	2.92	2.01	3.01	....	34.29
Mean precipitation for 31 years	4.22	4.05	4.19	2.85	3.46	3.61	3.36	3.64	3.37	4.00	4.44	3.76	....	44.95
No. of days with precip. of .01 in. or more	5	7	11	2	9	13	10	....	5	7	6	9	....	84
Snow fall in inches	10	13.5	28	0.5	....	....	....	....	....	....	7.5	6.5	....	66.0
Average snow fall for 31 years	23.1	21.8	17.1	6.0	....	....	....	....	....	1.0	7.8	16.9	....	93.7
Number of clear days	13	12	8	19	17	14	11	18	12	12	10	10	....	156
Number of fair days	12	7	8	10	5	10	9	4	6	4	4	4	....	83
Number of cloudy days	6	9	15	1	9	6	11	9	12	15	16	17	....	126
Total movement of wind in miles	6898	6744	8241	5391	6832	5547	5321	4352	5500	5021	4857	5489	....	.....

REPORT OF THE TREASURER.

Maine Agricultural Experiment Station in account with the United States appropriation, 1898-9.

DR.

To receipts from the Treasurer of the United States as per appropriation for the fiscal year ending June 30, 1899, as per act of Congress approved March 2, 1887		$15,000 00

CR.

By salaries:		
(a) Director and administration officers	$2,194 26	
(b) Scientific staff	4,493 48	
(c) Assistants to scientific staff	1,215 13	
(d) Special and temporary services	51 96	
Total		$7,954 83
Labor:		
(a) Monthly employees	$450 00	
(b) Daily employees	1,319 66	
Total		1,769 66
Publications:		
For envelopes for bulletins and reports		229 93
Postage and stationery		357 61
Freight and express		154 62
Heat, light and water		829 67
Chemical supplies:		
(a) Chemicals	$197 06	
(b) Other supplies	201 18	
Total		398 24
Seeds, plants and sundry supplies:		
(a) Agricultural	$57 17	
(b) Horticultural	260 43	
(c) Botanical	10 00	
(e) Miscellaneous	83 50	
Total		411 10
Fertilizers		$71 45
Feeding stuffs		486 82
Library		279 83
Tools, implements, and machinery		544 42
Furniture and fixtures		242 09
Scientific apparatus		42 93

Live stock:		
(e) Poultry	$154 00	
(f) Sundries	143 55	
Total		$297 55
Traveling expenses:		
(a) In supervision of Station work	$118 77	
(b) In attending various meetings	60 48	
Total		179 25
Buildings and repairs:		
(a) New buildings		750 00
Total		$15,000 00

ISAIAH K. STETSON, *Treasurer.*

I, the undersigned, duly appointed Auditor of the Corporation, do hereby certify that I have examined the books of the Maine Agricultural Experiment Station for the fiscal year ending June 30, 1899; that I have found the same well kept and classified as above, and that the receipts for the year from the Treasurer of the United States are shown to have been $15,000.00, and the corresponding disbursements, $15,000.00; for all of which proper vouchers are on file and have been examined by me and found correct.

And I further certify that the expenditures have been solely for the purposes set forth in the act of Congress approved March 2, 1887.

A. W. HARRIS, *Auditor.*

Maine Agricultural Experiment Station in account with Fertilizer Inspection for the year ending December 31, 1899.

DR.

To receipts for licenses		$2,805 00

CR.

By balance from account of 1898	$20 04	
Collection and analyses of samples	1,831 27	
Executive and office expenses	700 00	
Balance to account of 1900	253 69	$2,805 00

Maine Agricultural Experiment Station in account with Feed Inspection for the year ending December 31, 1899.

DR.

To receipts for inspection tags, 1899	$2,112 19	
Balance to account of 1899	786 07	$2,898 26

CR.

By balance carried from 1898 account	$1,014 01	
Collection and analyses of samples	773 48	
Tags	410 77	
Executive and office expenses	700 00	2,898 26

Maine Agricultural Experiment Station in account with Creamery Inspection for the year ending December 31, 1899.

DR.

To fees for calibrating glassware	$53 34

CR.

By expense calibrating glassware	$53 34

Maine Agricultural Experiment Station in account with "General Account" for the year ending June 30, 1899.

DR.

To balance from 1897-8	$798 54	
Sales of produce, etc	2,425 58	$3,224 12

CR.

By labor	$292 54	
Freight and express	32 10	
Seeds, plants, and sundry supplies	75 23	
Feeding stuffs	61 57	
Library	10 90	
Tools, implements and machinery	30 79	
Furniture and fixtures	8 10	
Scientific apparatus	43 13	
Live stock	114 25	
Traveling expenses	25 28	
Contingent (chiefly insurance)	424 01	
Buildings and repairs	800 93	
Balance to 1899-1900 account	1,305 29	3,224 12

APPENDIX.

Annual Report of the State Pomological Society.

1899-1900.

CONTENTS.

PROF. ELIJAH COOK, VASSALBORO.
Secretary Maine Pomological Society. Died December 29, 1899.

INTRODUCTORY.

Owing to the sudden death of Secretary Cook, just at the close of the year, preparation of a report of the work of the society during 1899 seemed necessarily to devolve upon the President, who was, perhaps, most conversant with that work. Naturally, however, many points that would have been included by the Secretary may be omitted in the hasty preparation of the subjoined notes.

Special mention should be made of the care with which Secretary Cook preserved the records, and of the efficient services of his daughter, Miss Eva Cook, in getting together necessary data.

IN MEMORIAM.

Secretary Elijah Cook.

By the death of Professor Elijah Cook, the Pomological Society loses its secretary, the State Grange its lecturer, the community a public-spirited and strictly honorable citizen, and the poor a friend whose sympathy was unbounded. Although the greater part of his life was occupied in teaching, he ever longed to come more closely in touch with nature, and on his return to this, his native State, after an absence of nearly thirty years, he purchased a farm, and in order to obtain the best results from the same, felt that he must make himself acquainted with the best methods, both in the cultivation of fruits and the tilling of the soil. In consequence he seized the first opportunity to become a member of this society. When chosen secretary, he remarked in his emphatic way: I mean that under my jurisdiction the Pomological Society shall be all that I am capable of making it, by putting into it my best energies. Prof. Cook's success, in whatever he was engaged, was due to his indomitable will and energy of character. This was most markedly displayed while he was yet a young man. He decided at an early age to make teaching his profession and as he was obliged to depend entirely upon his own efforts in fitting himself for this position, he left no stone unturned towards its accomplishment. He even made forty days to the month, during one school vacation, by weaving in the factory nights and a part of each day; thus fitting himself, the man, to become the helpmeet that he was in after years to the hundreds of young men who were fortunate enough to come under the tuition of a man so strong, so self-reliant and yet so unostentatious, kind-hearted and just. No scholar come under his influence, without imbibing something of his nobility and grandeur of soul. Recognizing most keenly all the faults and mistakes of his pupils, he ever had the most complete faith in their latent powers and inmost soul life and in consequence was capable of calling out the best in them, which is always the mark of the true teacher. Few men have stamped more indelibly than he on the minds of a greater number of young people, traits of character that will make them truer men in their homes, better citizens in their communities and more loyal to their country.

Professor Cook was born at Milo, May 6, 1839. When but four years old he came, with his parents, to Vassalboro, where he remained till he went to Providence to fit himself for the profession which he followed ever after, with the exception of two or three years spent on his farm in Iowa and the two years previous to his death, in Vassalboro.

IRENE B. POPE.

REVIEW OF THE YEAR.

Concerning the fruit interests of Maine, the past year has been remarkable chiefly for the uneven distribution of the crop and for the severe attacks of the forest tent-caterpillar.

Many of the best orchards in the State failed to produce a crop this year while others produced an abundant crop. For instance, one of the largest orchards in Kennebec county produced barely 300 barrels of fruit, while the orchards of Aroostook county were burdened. One firm in Presque Isle shipped more than 1,500 barrels. There is little doubt that the reason for this irregularity in the fruiting of Maine orchards, lies primarily, in the lack of proper care; the trees were allowed to overbear in 1896 and were so weakened that few fruit-buds were formed during the next year or so. On this account little attention was given to tillage, pruning or spraying, and when the caterpillars came in 1897 and 1898, the trees were still further weakened. Therefore, even though apparently free from disease and insect attack this year, there was a lack of buds for producing the desired results. In general, those orchards which have received the same care during the unproductive years as when a full crop was expected, have repaid that care in this year when fruit was scarce and prices were high.

In many parts of Kennebec, Franklin and Oxford counties, the orchards were seriously attacked by both forest and apple tree tent caterpillars. The timely use of Paris green, however, in most cases proved an effectual means of protection. In Kennebec county a band of paper placed around the trunks of the trees, and covered with a mixture of lard and sulphur, proved an effective barrier to the half-grown caterpillars which migrate from the forest or from neighboring trees.

The crop of small fruits was seriously reduced by the long drought of the summer, but, as with the orchard fruits, those plantations which were thoroughly tilled and cared for, gave satisfactory returns. Of the newer strawberries, Clyde and Glen

Mary seem to be growing in general favor, while the Loudon is attracting considerable attention among raspberry growers. Of the currants, White Imperial is highly recommended for home use; but Fay, in spite of its weak habit of growth, remains the leading market sort.

I wish to emphasize, in this connection, the fact that success in fruit growing comes only as the result of patient, persistent effort, and the three elements to strive after are: More fruit from individual plants; fruit of better quality, and the application of business principles in grading, packing and marketing.

THE WORK OF THE SOCIETY.

By the act of incorporation, the Maine State Pomological Society was constituted "a corporation for the promotion of fruit culture." For many years, however, there has been a difference of opinion as to how the interests of fruit growers may best be subserved. Early in the history of the society special meetings or horticultural institutes were suggested, but few were held, and gradually, the policy of spending the larger part of the available funds of the society in the payment of premiums and exhibition expenses, was developed. While the importance of well-organized exhibitions is conceded, the present officers of the society undertook the difficult task of placing the work upon a broader basis, in accordance with the vote of the society at the time of their election. In this task the President and Secretary, upon whom the immediate planning of the work has devolved, have been greatly aided by the sound judgment and advice of their predecessors.

During the year, the premium list for the usual autumn exhibition was thoroughly revised by the executive committee, with the purpose of encouraging the cultivation of those fruits and flowers which merit special attention and excluding those which are only of local interest or are not worthy. A second, abridged, list was prepared for the special winter meeting at New Gloucester.

Besides the two-days' meeting for discussion at Newport, in connection with the autumn exhibition, special field meetings were held at Greene, at Manchester, and at Camden, and a winter meeting and exhibition, at New Gloucester. (The latter, though held in January, was arranged for in 1899, and the expenses were met from that year's funds.) In these meetings an effort was made to meet the special needs of the particular localities where the meetings were held, as well as to bring out thoughts which should be applicable to the whole State.

THE OUTLOOK.

While encouragement of the pomological interests of the State should remain the primary object of the society, more attention should be given to beautifying the homes of Maine, and to fostering a love for attractive surroundings. It is hoped that during the ensuing year these subjects may be more fully developed. Never before in the history of the State was the outlook more promising for intelligent earnest effort along horticultural lines, and never before in its history has the Maine Pomological Society been so well able to come to the aid of those interested in the work which it represents.

W. M. MUNSON,
President.

OFFICERS FOR 1899.

President.

W. M. MUNSON, Orono.

Vice Presidents.

S. H. DAWES, Harrison,
D. P. TRUE, Leeds Centre.

Secretary.

ELIJAH COOK, Vassalboro.

Treasurer.

CHARLES S. POPE, Manchester.

Executive Committee.

The President and Secretary, *ex-officio;* John W. True, New Gloucester; R. H. Libbey, Newport; L. F. Abbott, Lewiston.

Trustees.

Androscoggin county, John Briggs, Turner.
Aroostook county, Edward Tarr, Castle Hill.
Cumberland county, T. M. Merrill, West Gloucester.
Franklin county, F. D. Grover, Bean.
Hancock county, Mrs. S. L. Brimmer, Mariaville.
Kennebec county, E. A. Lapham, Pittston.
Knox county, Alonzo Butler, Union.
Lincoln county, H. J. A. Simmons, Waldoboro.
Oxford county, Lemuel Gurney, Hebron.
Penobscot county, C. A. Arnold, Arnold.
Piscataquis county, H. L. Leland, East Sangerville.
Sagadahoc county, A. P. Ring, Richmond Corner.
Somerset county, F. E. Nowell, Fairfield.
Waldo county, Fred Atwood, Winterport.
Washington county, J. F. Sprague, Charlotte.
York county, C. A. Hooper, Eliot.

Member Experiment Station Council.

CHARLES S. POPE, Manchester.

BUSINESS TRANSACTIONS.

MEETINGS OF THE EXECUTIVE COMMITTEE.

AUGUSTA, January 24, 1899.—At this meeting it was voted to supply the Secretary of the State Board of Agriculture a speaker to represent the Pomological Society at such institutes as he may desire; the Board of Agriculture to pay simply the travelling expenses.

Voted, That a special field meeting for demonstrating methods of spraying be held in May.

Voted, That the annual meeting and exhibition be held during October or November.

Voted, That as many horticultural schools be held as the funds of the society will permit.

AUBURN, May 8, 1899.—At this meeting it was voted that the annual meeting and exhibition be held at the time and place of the dairy conference of the State Board of Agriculture, provided this occur on or before November 15.

Voted, That the society unite with the Board of Agriculture in holding a field meeting at Sagamore Farm, Camden, during the first week in June.

The question of holding an exhibition in conjunction with the State Agricultural Society was discussed but action was indefinitely postponed.

AUBURN, August 16, 1899: It was voted that the society loan to Mr. A. E. Andrews the plates, vases, racks and vials, for use at the State Fair.

It being found that the time of the dairy conference, would be unsatisfactory, the previous action was reconsidered and the Secretary was requested to arrange for a meeting at Newport, to be held November 15 and 16.

W. M. Munson and Miss G. P. Sanborn were appointed delegates to the meeting of the American Pomological Society to be held in Philadelphia, September 7 and 8.

The premium list for the annual exhibition was revised and extended.

ANNUAL MEETING.

NEWPORT, November 17, 1899.—The minutes of the several meetings of the executive committee were read by the Secretary and were approved.

Professor Munson, as delegate to the American Pomological Society, reported that this old society has taken a new lease of life and that the meeting was most enthusiastic and successful.

The treasurer made an informal report of the finances of the society and it was accepted; the full report to be printed in the transactions.

The election of officers resulted as follows: President, W. M. Munson; Vice Presidents, S. H. Dawes; D. P. True; Secretary, Elijah Cook; Treasurer, Charles S. Pope; Executive Committee, J. W. True, R. H. Libbey, L. F. Abbott; Auditor, Z. A. Gilbert; Member Experiment Station Council, Charles S. Pope.

Amendments to the by-laws were offered as follows:

"Only life-members shall be eligible to hold office in this society."

"No person who has not been a member for at least one year shall be entitled to vote in the society."

Both amendments were laid upon the table for one year.

The president announced the following standing committees:

Nomenclature and New Fruits.—Z. A. Gilbert, Chas. S. Pope, D. H. Knowlton.

Entomology.—F. L. Harvey, Willis A. Luce, G. P. Sanborn.

Botany and Vegetable Physiology.—C. G. Atkins, L. F. Abbott, H. A. Robinson.

The committee on resolutions reported as follows:

Resolved, That the Maine Pomological Society heartily appreciate the efforts of Sebasticook Grange to make this meeting of the society a success, and that we are under special obligation to the members of the choir for the excellent music rendered.

Resolved, That particular mention should be made of Mr. R. H. Libbey, whose active interest and energetic labors have done so much to further the objects of the society.

Resolved, That the society recognizes its obligation to the several newspapers which have given so freely of space for announcements and reports.

Resolved, That the thanks of the society are hereby extended to the Maine Central Railroad for reduced rates and to the proprietor of the Shaw House for the excellent service and low rates given.

PUBLIC MEETINGS.

PAPERS, DISCUSSIONS, AND QUESTIONS.

FIELD MEETINGS,
At Greene, Manchester and Camden.

ANNUAL MEETING,
At Newport.

WINTER MEETING,
At New Gloucester.

FIELD MEETING AT GREENE.

A Pomological School was held at the Grange Hall, Greene, May 9, when the subject of "Small Fruits" was presented by Mr. Chas. S. Pope; "Orcharding" by Secretary Elijah Cook, and "Spraying" by President W. M. Munson. The preparation of Bordeaux mixture and kerosene emulsion were illustrated as were also the right and wrong methods of spraying.

SMALL FRUITS FOR THE HOME GARDEN.

CHAS. S. POPE, Manchester.

(Abstract.)

When the wood was cut off and the land was first cleared our fields and pastures abounded in wild berries and the farmer's table was well supplied with these, but in most localities it is now impossible to furnish a suitable supply from this source. The small fruits, once regarded a luxury, are now considered not only a necessity but an economy also. Therefore the farmer who provides for the table should not neglect his duty in this direction. Ten square rods, well fertilized and tilled, will furnish nearly as many bushels of berries. It may need a little experience to learn the requirements of the different varieties, and then there is no more difficulty in growing a crop of strawberries than one of peas or cabbage. I can assure you it requires only a little Yankee grit to overcome all the difficulties and learn the secrets of success.

THE STRAWBERRY.

The strawberry has the advantage of giving a full crop the next year after setting. Although the plant is small it gives such an immense crop of fruit that it must be well fed and watered. There is very little danger of getting the soil too rich in phosphoric acid and potash, but some varieties will give an excess of foliage, at the expense of fruit, if too much nitrogen is used. Hard wood ashes are generally easily obtained and make one of the best fertilizers for all fruits. Plow deep and cultivate thoroughly that the plants may take deep root and be able to withstand the drought which frequently comes just as the fruit is filling out.

If the plants are set in rows three feet apart and kept in narrow matted rows (6 inches wide), by cutting all runners which extend beyond this, the ground can be worked with the horse cultivator, when working the vegetable garden. Do not wait until the weeds begin to grow before stirring the soil, but every few days run over the ground and see what a wonderful effect it will have upon the plants. So many of our people till the ground only to kill the weeds and have not learned the effect, and do not realize the need of this frequent stirring of the soil. To obtain a full crop the plant must have a large supply of water when the berries are filling out and there is nothing like a fine earth mulch to conserve the moisture and thus furnish a good supply when most needed. If you have but a little patch, take the hoe along every time you go out to look at it, particularly if the ground begins to bake a little after a shower. Most people do not realize what hoeing means to the plant.

Do not select a piece of land for the strawberry bed where the water can stand and freeze in the winter. As we are not sure of a blanket of snow on the bed all winter, it is best to cover with evergreen boughs as soon as the ground freezes in the fall. Swamp hay or some such material may do as well if not put on deep enough to smother the vines. Do not remove the covering too early in the spring as the frequent freezing and thawing may work much injury to the roots.

There are many little things that must be learned from experience. Do not be discouraged if you fail the first time. My first patch did not give me a quart of berries. A friend gave me the plants and they were a pistillate variety with no other kind to fertilize them. My next attempt was a total loss, as the ice formed on the bed and killed nearly every plant. But the next time I succeeded, although I planted, contrary to all advice, on a heavy witch-grass sward. We picked over two hundred quarts

TREE OF BELLFLOWERS IN ORCHARD OF N. F. NORTON, SOUTH PENOBSCOT.

from five square rods. I attributed my success largely to the use of the hoe. The witch-grass made a strong fight but by taking pains I never allowed it to breathe, and easily came out the victor.

RASPBERRY AND BLACKBERRY.

The treatment of the raspberry and blackberry should be much the same as I have recommended for the strawberry. Do not plant too closely. Three feet apart in the rows, allowing seven feet for blackberries and at least six feet for a row of raspberries, is the proper distance. Keep all sprouts cut down, as weeds, except a few in each hill. More berry patches are ruined by allowing too many sprouts to grow than from any other cause. What I have said about cultivating the soil applies here as well as in the strawberry patch. The raspberry roots run very near the surface and the soil must be kept moist and free from weeds, but worked very shallow.

VARIETIES.

I have little to say about varieties of small fruits, as soil and situation have so much to do with this question. Among strawberries, Crescent and Greenville have been the most prolific with us. Beder Wood and Clyde have been used to furnish pollen for these varieties. The Clyde will produce a large quantity of fruit if given a deep rich soil and plenty of water, but with ordinary treatment is hardly equal to the two first named.

The Snyder blackberry is probably one of the hardiest on the list and will give fine fruit if allowed to remain on the bush until fully ripe,—this means several days after it turns black.

Among the red raspberries, the Cuthbert is an old standard and one of the best. To prevent winter-killing I would recommend bending over the canes and throwing a little dirt on the tips to hold them down. A few shovelfuls of dirt at the base of the canes will prevent breaking at the ground.

The White Imperial Currant is not as acid as the red currants and is therefore fine for the home table. Fay's Prolific is the best red currant we have fruited among a dozen kinds.

In conclusion I would say, secure plants as near home as possible, of the standard sorts, which thrive best in your locality.

These are much more likely to succeed than plants by mail or express from distant nurseries. If you have plenty of money to spare for experimenting, there is great pleasure in testing the new varieties, but few of them are equal to the old standards.

ORCHARDING.

Secretary ELIJAH COOK, Vassalboro.

(Abstract.)

Professor Cook said, in part: While the natural conditions of soil and climate in Maine are well suited for the most successful orchard culture, our methods are not the best. There is everywhere evidence of a lack of care in cultivating and pruning, as well as in harvesting and marketing the product.

The importance of cultivating the young orchard and of careful attention to pruning and spraying were emphasized. In the matter of packing and marketing the product we have much to learn from the California growers. California fruit of inferior quality will outsell native fruit because it is put up in attractive packages.

The abundant use of fruit on the farm will tend to keep the young people at home, and this is a most important thing to do.

With careful attention to details, the outlook for fruit-growing in the State of Maine is very encouraging.

SPRAYING.

Prof. W. M. MUNSON, Orono.

(Abstract.)

"It is commonly estimated that the annual yield of all crops is lessened about 25 per cent. by the attacks of injurious insects and fungous diseases. Experiments have demonstrated that at least 75 per cent. of this loss can be prevented by the use of simple remedies applied by means of a spray pump. Expressed in figures, the annual loss would represent about $500,000,000 in the United States alone. Of this amount, 75 per cent., or $375,000,000 can be saved by spraying."

The above paragraph represents the facts concerning the importance of spraying, at the present time.

Spraying has ceased to be an experiment. The beneficial results obtained at the experiment stations have been fully corroborated in practical field work, and now it is important to know the *how* and the *why* of spraying. In other words, in order that the best results may be obtained, spraying must be done intelligently.

Success in spraying, as in most of the work in life, is largely a matter of detail. Little things, seemingly unimportant, all affect the results obtained. Failure may usually be attributed to lateness of application, carelessness in applying or in preparing the material, or to defective apparatus.

WHY SPRAY?

Spraying is plant insurance. It is, with few exceptions, a *preventive* measure for many of the ills that plants are heir to, and *not* a cure. There are several distinct classes of enemies which may be grouped first under the two general heads,—insects and fungi.

The insect enemies are naturally divided into distinct classes which must be met in very different ways, and the same is true of the fungi. The first class of insect enemies includes those that, either in the mature form or as larvæ, eat the plant tissue; e. g., the plum curculio, the codling moth, the currant worm, the tent caterpillar, the potato beetle, etc. These are very readily destroyed by the application of some form of arsenic, as Paris green, to the parts which will be eaten.

Another class of insects, e. g., the plant lice and some of the scale insects, obtain their food by sucking the juices of the plant and, therefore, are not affected by an application of poison. These must be overcome by an external irritant, such as kerosene, or an alkali like caustic soda or strong soap suds, or by some material that will close the breathing pores and thus stop respiration, e. g. pyrethrum or hellebore (in the dry form hellebore acts in both ways).

Fungi (singular, *fungus*) are simply low forms of plant life which feed upon organic matter, either living or dead. Those which grow on living tissues—*parasitic fungi*—are the ones with which we are specially concerned. It is these which cause many of the blights and rusts, and smuts and scabs and mildews of various plants. Fungi are propagated by means of minute, microscopic bodies, called spores, which are carried from place to place by the wind and by insects, birds and other animals. A spore, falling upon the surface of a leaf, or the growing tip of a branch, if in the presence of moisture and the usual summer temperature, germinates in a manner very similar to that of a seed. If the surface of the leaf or fruit is coated with some material which is destructive to the young fungus, as the spore germinates, all the damage from the parasite is warded off. If, on the other hand, there is even a small spot that is not coated, there is opportunity for the parasite to obtain a foothold. With few exceptions, after the parasite has once attacked the plant, spraying is of little if any avail.

WHEN TO SPRAY.

The time of spraying will depend upon the purpose in view, but in *no case* should spraying be done when the plants are in full bloom. Spraying at this time will often interfere with the fertilization of the flowers, and consequently reduce the crop of fruit, while there is much needless destruction of bees and other insects which work upon the flowers.

In general, spray *early*. "Delays are dangerous." Fruit trees should be sprayed before the buds open, potatoes before disease or insects appear. Subsequent treatment will depend very largely upon the nature of the season; if very wet, it may be necessary to spray every two or three weeks; if relatively dry, three or four treatments may be sufficient.

HOW TO SPRAY.

Insecticides and fungicides are more effective if applied in a liquid rather than in a dry form, since they adhere to the foliage better. *Sprinkling is not spraying.* The best results are obtained from the use of a fine spray or mist forcibly applied to the foliage; and so far as possible, it should reach the under sides of the leaves. A fine mist is preferable to a coarse spray, as there is much less waste of material and much less danger of injury to the foliage. A single dash of the mist is better than continued soaking, as in the latter case the material gathers in drops and runs off or injures the foliage.

As already stated, spraying for fungi is a preventive measure rather than a cure. If the surface of the leaf is not completely covered on both sides, with the protective coating, there is still danger of attack. The spores of the fungus may fall upon the smallest unprotected spot.

Again, while young insects may be killed by a very small dose of poison, a much larger amount will be required as they grow older. So spraying should be commenced early, that the first meal of a young insect may be his last, and in order to insure this end, the poison must be finely divided and evenly distributed.

THE MATERIALS FOR SPRAYING.

The materials used in spraying are mainly of two general kinds, fungicides, used in killing fungi, and insecticides, used in killing insects. The principal fungicides are Bordeaux mixture and sulphide of potassium. The more important insecticides are arsenic, in some form (usually Paris green), kerosene and tobacco.

Bordeaux Mixture. This is the fungicide *par excellence* for general use, and its preparation is a matter of considerable importance. The formula in general use at present is known as the "4, 4, 40" formula. In other words the mixture consists of 4 lbs. copper sulphate, 4 lbs. fresh lime and 40 gallons of water. The copper sulphate should be dissolved in three or four gallons of water in a wooden or earthen vessel and the lime (which must be absolutely fresh) should be slaked in a separate vessel, and diluted with water till it is of a milky nature. When ready for use, the two solutions may be mixed in a third vessel, care being taken to stir constantly during the process. In every case, the mixture should be passed through a sieve of number 50 brass wire cloth, or through cheese cloth backed by common window screen wire. This straining is necessary to prevent clogging of the nozzle.

Potassium Sulphide. Potassium sulphide, or "liver of sulphur" is specially valuable as a preventive of gooseberry mildew and for use in the greenhouse. In using this material four ounces of the sulphide are dissolved in ten gallons of water.

Paris Green. This material is the one which is always reliable for the destruction of leaf-eating insects. Many other forms of arsenic have been recommended, but none have proved so generally satisfactory as Paris green.† It is practically insoluble in water, but as there is usually present a small amount of soluble arsenic, it is always well to add a little fresh lime to the mixture before applying, that injury to the foliage may be averted. Paris green is generally mixed with water in the proportion of 1 pound to 200 gallons. If lime is added, however, a pound to 100 gallons may be used.

Kerosene. Kerosene is the specific for all sucking insects. It kills by contact and, owing to its cheapness and efficiency, will probably remain the most valuable insecticide for this class of insects. The form in which it is usually applied is the soap emulsion, but there are now several forms of spray pumps which make a mechanical mixture of kerosene and water, thus greatly reducing the labor.

Tobacco. A strong decoction of tobacco ("tobacco tea") is often used with success in destroying the lice upon rose bushes and tender, soft-wooded plants.

† Among the cheaper substitutes for Paris green are "Green Arsenite," "Paragrene," "Emerald Green," "Arsenite of Soda," "Arsenate of Lead," etc. With the exception of the last named, which is largely used by the Gypsy Moth Commission of Massachusetts, the substitutes are still to be considered as experimental.

ARRANGEMENT OF STAGE AT THE WINTER MEETING OF MAINE POMOLOGICAL SOCIETY, NEWPORT, NOV. 16 AND 17.
From photograph by F. M. Dearing, Newport.

The meeting having adjourned to the open field, the speaker proceeded to illustrate the preparation of Bordeaux mixture and of Kerosene emulsion in actual practice. The character of the spray thrown by different nozzles was shown, and several neighboring trees were sprayed. The working parts of various pumps were also explained.

FIELD MEETINGS AT MANCHESTER AND CAMDEN.

MAY 5, AND JUNE 6, 1899.

In accordance with a vote of the executive committee, the society united with the State Board of Agriculture in holding field meetings at Manchester and at Sagamore Farm, Camden. The President and Secretary attended these meetings and spoke upon the same subjects as at the field meeting at Greene. Mr. Pope also addressed the meeting at Manchester, and assisted in the demonstration of spraying.

ANNUAL MEETING AND EXHIBITION.

NOVEMBER 16 AND 17, 1899.

NEWPORT, ME., Thursday, Nov. 16, 1899.—The meeting was called to order by the president who, after prayer by Chaplain J. W. Webster of the G. A. R., and singing by the grange choir, called upon Hon. J. M. Sanborn of Newport for an address of welcome.

ADDRESS OF WELCOME.

Hon. J. M. SANBORN, Newport.

Mr. President, Members of the State Pomological Society and Fellow Citizens:

In behalf of the members of Sebasticook Grange and the citizens of the town of Newport, we bid you a sincere and hearty welcome, and extend to you the hospitalities of our town. This is the first time that we have had the honor of your presence with us, and we beg to assure you that your visit will be fully appreciated. We feel that you will pardon us, if we say that your welcome, perhaps from a selfish standpoint alone, is all the more cordial because we wish to place ourselves at your feet for needed instruction. We wish to say that Newport is becoming a prosperous town. We are ambitious, we are determined to expand and develop to the utmost our resources, but in righteous and just ways alone. Now we are the natural center of an extensive agricultural district. The soil of the Sebasticook river, which drains Western Penobscot and Eastern Somerset counties, is not rivalled, in our judgment, in fertility and remunerative capacity, under proper conditions, by the far famed lands of the Aroostook valley.

As a village, therefore, we are interested in agriculture. Our continued development depends largely upon the prosperity of the farmer. He will be considered our greatest statesman and best friend who will do the most to secure and maintain that prosperity. But, notwithstanding our natural advantages, the science of fruit culture in its various branches, is almost in its infancy throughout this community. We have but few large orchards, we may state still fewer good ones. With a few shining exceptions here and there, this whole subject has been sadly neglected by our farmers. Indeed, but little effort was made by too many of them to save their fruit trees from the ravages and blighting effects of the worms and caterpillars during the past season. But on the whole, we feel that our farmers are coming to understand more and more that agriculture is a science which must be mastered, if success is to be attained. They are beginning to study, they are anxious to learn. Thrice welcome then are those who will give the instruction, the enlightenment needed.

It seems to us, further, that the State owes to its grange and to your society a debt of gratitude. Your works have been good in the past, your influence broad in sustaining and restoring sick and discouraged agriculture. And this must always operate as an element of your welcome wherever you may meet. We are all aware of agriculture's deep depression during the past years in this State; of the hard struggle of many of our farmers to maintain themselves, of their trials and discouragements. We have deplored the fact that some of them have felt forced to abandon their homes and seek other occupations. We have felt sad to know that our rural population has been constantly decreasing. The night has indeed been dark, the prospect gloomy. But we believe that a brighter day has already dawned. The law of compensation applies. During this very depression the old system of farming has passed away, a system of theory, of uncertainty, too often of ignorance, with all its weakening and disastrous results.

And on the grave of that old system has sprung up another, a broader, and a better one, a system which requires thoroughness and a practical and scientific knowledge of the subject, a system which exacts that the successful farmer shall be a man of thought and of study as well as of labor, a system which ordains that he shall be a comprehensive man, that he shall look beyond the boundaries of his own fields, participate earnestly in the affairs of State and see to it that his State's laws are wise and wholesome and not injurious to his interests. That agriculture has had this new birth, that we have to-day some prosperous farmers among us, that we feel and have faith to believe that there is coming to the intelligent farmer in the near future a prosperity, the like of which has never been known, is due to some extent surely, we think largely, to the labor and beneficent influence of the grange and your society. We therefore hope that you will enjoy your visit with us and that your good works and influence may continue to increase until this community and the whole State shall contain a population of prosperous and contented farmers. Then, and not until then, will your mission be performed.

RESPONSE—IN BEHALF OF THE SOCIETY.

Secretary ELIJAH COOK, Vassalboro.

Ladies and Gentlemen: It gives me great pleasure to have an opportunity of thanking the honorable gentleman who has so ably, so warmly, and so earnestly bid us welcome to Newport. And to thank the good people of Newport who have worked so earnestly to make this meeting a success. I have been pleased ever since I stepped off the train and met the large-hearted, broad-minded Brother Libbey, and have learned so well the earnest work which he has done, together with the good people of Newport, to provide for all our wants; to help in every way possible to get all the advantage, all the good, that can be obtained from our meeting. We see evidence upon every hand that all the people of Newport are anxious to make our coming here a success, and we are pleased, grateful, and thank these people most earnestly for what they have done.

Every toiler of the soil needs encouragement, needs information, needs inspiration, to help him to make his calling a success, and we hope, in coming here among you, to help you to some extent to enlarge the profits of the farm, to encourage you to improve the methods and enlarge the possibilities of agriculture in this favored section of the State. And when I say favored section of the State, I mean favored of any part of the world. In the great depression through which agriculture has passed, there was no spot on all the earth that suffered less from that depression than this northeast corner of our land. There is no part of all the world that has suffered less or that has more courage to take hold anew and make success in the future. I was pleased with the words to which we have listened. The law of compensation is true, and we have gained much during the depression through which we have passed. We have gained more than we could estimate, if we tried, in the one thought of teaching better, higher methods in the future. The old methods will not do; they have passed away. They served their purpose, but in agriculture, as in everything else, we must use business principles; we must use intellect; we must use thought and investigation all the time. And we hope that our coming here

ORCHARD OF C. S. PHINNEY, STANDISH, FALL OF 1899.
View of Small Trees which have been set three years, showing method of cultivation. Strip of wire netting on the trunk of each tree.

to this section will encourage farmers to take hold of fruit culture more earnestly. If anything that may be said in this hall shall encourage a part of the farmers here to make two trees flourish and bear an abundance of fruit where there is now but one, a part, at least, of our mission will be accomplished, and no one can say that we have failed of success.

RESPONSE—IN BEHALF OF THE CITIZENS OF MAINE.

Dr. George M. Twitchell, Augusta.

Mr. President, Ladies and Gentlemen: What little I have to say is in behalf of those citizens of the State of Maine, present, who realize something of what it means to be so cordially reçeived under such attractive and pleasing conditions, where the labor of the husbandman, and of the housewife, are manifest in so many ways, in the decoration of the hall, and in the details of the work of the local committee, the magnitude of which is not appreciated, except by those who have been through the same labor. Let us first return thanks to Sebasticook Grange, and the citizens of Newport, who have made possible this pleasing display, and completed the arrangements for the two days' meeting of the society. I am very glad to hear Mr. Sanborn speak of the coming of better days. He who watches the State of Maine, to-day, must be conscious that the pendulum is swinging back, and that we are passing out of the stage of depression, and coming to better days in agriculture. Better days to investors and better days to the farmers of Maine. Not during my knowledge of the work in this State have there been so many calls from persons who desire good farm property in the State, as in the past few months. The atmosphere is different from what it was ten or twenty years ago. Here in Newport you have been growing prosperous. I asked the manager of the condensed milk factory to what he attributed the great change, and he pointed to the corn canning factory. I asked the manager of the corn canning factory the same question, and he pointed to the condensed milk factory. Such harmony tends toward the prosperity of the community. The farms throughout this section give evidence of improvement. At the same time we all realize that the fruit industry of this section is not what it ought to be, and the fruit industry of Maine, and of New England, is not what it ought to be, but by such gatherings as this we solve some of the problems, and get that interest, uplift and stimulus which sends us back to the farms to push the work a little further, and a little harder, than we have in the past.

Professor Robertson, a few weeks ago, in setting forth the marvelous advancement in Canada during the past ten years, gave as the reason above all else why this advance had been so marked, that the "Press of Canada is a unit in praise of the farmers."

Now that one sentence stands as a solution of the whole problem we have to face to-day. Along our dairy and fruit lines let us all have words of praise. When the press stops to criticize there is woe. When the farmers stop complaining of hard times and set their faces toward better times, determined to find them, conscious of the fact that they are solving some of the problems, the trees will not die, and a happy, contented and prosperous people will be settled on the farms of Maine, and elsewhere, and we shall all be singing the song of rejoicing.

Thanking the citizens of Newport for their generous and hospitable welcome, let us take up the last thought that Mr. Sanborn gave us, let us stop complaining and set our faces toward the sun.

THE PRESIDENT'S ANNUAL ADDRESS.

Prof. W. M. MUNSON, Orono.

In accordance with the custom of previous years it becomes the duty of the president of the society to deliver a short address upon the work of the society, or some subject relating to horticulture. As workers in the same field, we are all seeking to learn the best things to do in the line of horticulture and the best way of doing them. We are striving to bring to bear, in this search after truth, the thought of the scientist, the art of the expert gardener or fruit grower, and the results of the patient experimenter.

It is only by careful, varied and repeated trials and often after bitter disappointments and discouragements that fair conclusions and substantial results are obtained. So in the practical branches of horticultural work, success, in other words, financial gain, comes not to the shiftless or the indolent, but to the wide-awake, up-to-date, energetic growers who profit by the experiences of other growers as well as by their own mistakes and triumphs.

Instead of speaking at length of the work and the aims of the society at this time, I shall ask you to look with me for a few moments at some of the features of the pomology of our State which have not received sufficient attention in the past.

A few years ago Mr. D. H. Knowlton, at that time secretary of this society, delivered a very interesting and instructive paper upon the "Possibilities of Fruit Growing in Maine," in which the advantages and opportunities in this line were most clearly set forth. It is not my purpose at this time either to discuss or to ignore the difficulties and hindrances which must be encountered. The diseases of fruit are apparently increasing in number and severity. The insect enemies are ever with us. But with increasing difficulties comes increasing knowledge of means of combating those difficulties. With the attacks of fungi come the improved fungicides; with the insects comes a broader knowledge of the use of poisons and preventive measures. Ten years ago the treatment of orchards with insecticides and fungicides was in its infancy, and "sprinkling" was ridiculed. To-day every enterprising orchardist in the State recognizes the importance of the practice. This advance in ideas is in no small degree a direct result of the discussions which have been held in the meetings of the Maine Pomological Society.

In the past our farmers have been urged to plant more trees and vines. In the present and the future the watchword must be improvement. Instead of investing more money in planting orchards we must now aim to secure greater returns from money already invested. More attention must be given to fertilizing the orchard, to culture, to tillage, to pruning, to thinning the fruit and to business methods in handling and marketing the product.

POSSIBILITIES IN AROOSTOOK.

No part of the State is better adapted for the general operations of agriculture than is Aroostook county—"the Garden of Maine." The winters of northern Maine are so severe, however, that until recently fruit culture has received comparatively little attention. Indeed, less than twenty years ago the positive assertion was made by a well-known fruit grower and nurseryman that fruit culture was impossible north of the latitude of Houlton.

The first settlers on the Aroostook river seem to have made no attempt at fruit raising. About forty years ago a few apple seeds were planted on some of the upland farms, but the results gave little encouragement. Such of the trees as lived bore inferior or worthless fruit. After a few years the tree-peddler found his way into this fertile, but at that time almost inaccessible region, and in succeeding annual visits introduced many hundred dollars worth of so-called hardy fruits, all of which soon succumbed.

About 1875 the Duchess of Oldenburgh was introduced from New Brunswick nurseries under the name of "New Brunswicker," and this was the beginning of a new era in the pomological history of northern Maine. The Duchess was followed by Alexander, Fameuse (the latter being rather uncertain) and, in 1882, by the Wealthy. A little later Tetofsky, Yellow Transparent and Montreal Peach were added to the list, while in 1890 Dudley's Winter began to be widely disseminated. The last named variety which, with the Wealthy, has proved to be one of the very best for this northern region, was raised from seed of the Duchess in 1880 by Mr. J. W. Dudley of Castle Hill plantation, and in 1889 was sold to Chase Brothers of Rochester, N. Y., who introduced it under the name of "North Star." The use of this name is unfortunate, since it already belonged to one of the "iron-clad" varieties of the northwest.

The pioneer in commercial orcharding in the Aroostook region was the late Hon. James Nutting of Perham. In 1887 Mr. Nutting planted an orchard of 100 trees three-fourths of which were Duchess, the remainder Alexander, Fameuse and a miscellaneous collection, most of which have since died. In 1885, 100 Wealthy trees were set, and later 500 more of the same variety, with several hundred Dudley's Winter. Among the varieties tried and discarded by Mr. Nutting were Peabody Greening, Red Astrachan, Pewaukee, McIntosh, Haas, Mann, Early Russian, Talman Sweet, Northern Spy, Tompkins King, Ben Davis and several others that are recommended as hardy.

In 1892 the Experiment Station undertook the introduction of hardy varieties into this region and several of the most promising sorts from the Northwest—Wisconsin, Minnesota and Iowa—were placed in Mr. Nutting's hands. Of these, some of the scions were set in bearing trees and others in the nursery. Most of these varieties have now borne, and some of them will prove decided acquisitions to the list of hardy fruits. Among the most promising varieties now on trial in this orchard are Arthur, Okobena, Patten Greening, McMahon, Longfield, Prolific Sweet, Ostrakoff.

About the time that Mr. Nutting commenced orchard culture on a commercial scale, Mr. J. W. Dudley of Mapleton, C. Hayford of Maysville, Benj. Tilley of Castle Hill, and several others awoke to the possibilities in this direction, and the prediction made at the meeting of this society in Bangor in 1891, that "within ten years Aroostook county will not only raise its own apples but have a surplus for export," has been fulfilled. For several years a few apples have been shipped from Caribou and Presque Isle, and during the present year 1,500 barrels were shipped by one firm, Robinson Bros., of Presque Isle.

The present status of fruit growing in Aroostook county is this: Under ordinary conditions every farmer who will, may grow sufficient fruit for his own use. In many parts of the county, particularly in the hills about Caribou, Washburn and Presque Isle, there are excellent opportunities for commercial orchards, but only the hardiest, "iron-clad" varieties will survive. A windbreak is an absolute requisite of success, but with this protection some varieties of special value may be grown. At the present time no varieties of plum or cherry have been found which are sufficiently hardy to withstand the climate without winter protection. One or two of the Russian cherries—particularly Griotte du Nord—are, however, promising for home consumption. Even the Mooers' Arctic plum, which originated at Ashland, is of uncertain hardiness unless top worked upon the "Canada" plum and laid down each winter.

BLUEBERRIES.

The blueberries of America have been strangely overlooked alike by horticulturists, and by historians; yet there are no less than six or seven distinct species which furnish fruit of considerable value, and as many more which, though of less importance, produce fruit which may be eaten.

Despite the great use that must have been made of the berries by the Indians and by the colonists in New England, there are but few records referring to this fruit. We learn that Champlain, as early as 1615, found the Indians near Lake Huron gathering blueberries for their winter store, and Roger Williams mentions "Attitaash (Wortleberries) of which there are divers sorts, sweet like currants." Aside from two or three minor references, these are about the only records, extant, except in the various botanies and floras published since the beginning of the present century.

Doubtless the reason for this apparent neglect is largely due to the abundance and excellence of the wild plants. There seemed to be no reason for the exertion incident to cultivation in order to procure a liberal supply of fruit.

In New York and in Michigan abortive attempts at cultivation have been made. At the Arnold Aboretum, in Massachusetts, Jackson Dawson has grown many seedlings and has learned some valuable lessons regarding methods of culture. At the present time, however, there is practically no systematic attention given to the garden culture of the blueberry, save that recently undertaken at the Maine Experiment Station.

In many parts of our State there are thousands of acres of land utterly worthless for agricultural purposes, which after the timber is removed, send up an abundant growth of blueberry bushes, alders, poplars, gray birches, etc., and which by proper management may, it is believed, be made to yield a handsome profit to their owners. In New Hampshire the picking of blueberries has come to be an important industry in many of the country towns. Whereas, a few years ago, farmers thought the blueberry crop of no account, and allowed perfect freedom in gathering the fruit; many of the owners of blueberry pastures now charge "stumpage" at the rate of two cents per quart, and the blueberry field is regarded with as much concern as the apple orchard.

In the southeastern part of Maine, principally in Washington county, there are about 150,000 acres known as the "blueberry barrens." The fruit from the barrens is mainly taken to the canning factories at Cherryfield, Columbia Falls and Harrington. The total output from these factories the present season was about 50,000 cases of two dozen cans each, representing a cash value of considerably more than $100,000.

Now, as already intimated, there are vast areas in our State which, while bearing a considerable number of bushes, and yielding a profitable return to the few people who make a practice of gathering the wild fruit, are not utilized as they might be. The systematic treatment of these wild lands, after the manner practiced on the barrens, might with profit be extended to many other sections.

Again, there are large areas, otherwise worthless, which might without doubt be made to yield good returns if in some way a growth of blueberries could be started—either by setting bushes or by scattering seed. Perhaps this suggestion may be regarded as visionary, but it is quite within the range of possibilities.

Another phase of the subject, which is worthy of careful attention, is that of domestication and the improvement of types by selection.

Little has been attempted in the garden culture of the blueberry. That satisfactory results might be obtained, however, there is little doubt. The fruit, in its wild state is far superior to that of many other cultivated plants and is very susceptible to the influence of environment. So I feel perfectly safe in predicting that within a very few years, a race of garden blueberries, rivaling in value some of the best of the other small fruits, will be placed before the public and the culture of the blueberry will be as much a matter of course as is that of the blackberry or the raspberry.

CRANBERRIES.

From time to time in the past, the cranberry has been called to the attention of the fruit growers of the State, but this fruit does not yet receive the attention its importance demands. The subject was treated so thoroughly by Prof. Harvey at the meeting of this society in 1896, and the practical details of culture were so well brought out at the last meeting in Augusta (1892), that I shall but refer you to the transactions of the society for those years.

CHESTNUTS.

In various parts of the State are rocky, sandy ridges which are of no particular value for general agricultural purposes, but which are specially suited for the growth of the chestnut tree. Since the common American chestnut is perfectly hardy in Maine, there is every reason why the many bushels of nuts that are used each year should be produced at home; thus adding to the wealth of the farmers, utilizing waste places, and, in many cases, hiding deformities in the landscape. Similar remarks will apply to the hickory nut and to the butternut.

FILBERTS.

The common hazelnut grows freely in many parts of our State, and we all remember the delights of childhood in romping through the fields in search of the brown prizes contained within the ample husks. Closely related to this nut is the English filbert, and I would call the attention of the society to these two nuts as affording a promising line of investigation.

EDUCATIONAL WORK OF THE SOCIETY.

Meetings for mutual interchange of ideas and experiences are most effectual educators. This society early conceived the idea of employing this means of carrying on its work. Right here may I digress for a moment and consider the bearing of education upon the advancement of horticultural interests? It is not the cramming of the mind with an array of facts which will be most beneficial. It is the appreciation of cause and effect; the growth of mental power; the ability to discriminate. There is a loud call for practical instruction from all sides. But the most practical instruction is that which makes an all round man. This is an age of specialists, but the specialist must have a foundation on which to build.

There is an element of uncertainty in all agricultural work. The skilled mechanic may select his material and, applying the principles he has learned, can construct a machine that shall be practically complete and in accordance with his plans and expectations. No farmer or fruit-grower can, however, predict with certainty the outcome of his labors. Nature and Providence have much to do with the processes, and we can only assist the one and submit to the other—we can control neither.

No agricultural college can turn out a farmer who can raise exactly 29 bushels and 35 pounds of wheat per acre year after year. But this does not signify that a young man is not better equipped for his life work because of the training he may obtain at an agricultural college. In other words, a thorough study of the laws of nature, as applied to agriculture, will reduce the uncertainties to a minimum, and will raise the possibilities of production to the maximum. The college brings to bear all of the sciences related to the subject—chemistry, geology, botany, physiology, entomology, etc., and gives to the young man who has these resources, provided he has the additional and very essential quality of sound common-sense, distinct advantage over the man who derives his information solely from the school of experience. In the words of one of the leaders in agricultural education: "The range of practical knowledge is so great that it is unwise to leave its acquirement to the uncertain chances of the chance farmer with chance information. The industry is so great that it is entitled to bring to its aid all that science can bestow, experiment can demonstrate, and observation can classify. There has, heretofore, been too little intellect and too much luck in the processes of agriculture; too little live investigation, and too much following in the rut made by others."

Granting the desirability of giving our young men and young women a college training as a preparation for their calling in life, we must still meet the fact that the vast majority of such young people, and the older ones as well, cannot avail themselves of such advantages. In order to reach those most in need of help, we must go where the people are. It is the old case of Mohammed and the mountain. If the Board of Agriculture would discuss farming and dairying, it must hold its institutes among farmers or dairymen. So if this society would aid the fruit-growers of the State, it must provide educational means within reach of the class it seeks to benefit.

The attention of the society has heretofore been called to the need of disseminating horticultural influence and information through the State. During the past year your executive committee have undertaken certain work along these lines. Special field meetings were held at Greene, and in conjunction with the State Board of Agriculture at Manchester and at Sagamore Farm, Camden, where the subjects of orchard culture and management were discussed and practical demonstrations of the preparation and application of insecticides and fungicides were made.

The officers have planned to extend this educational work as far as the funds will permit, by means of "horticultural schools" in various parts of the State. At these schools both principles and practical problems connected with the management of fruit plantations will be discussed by men thoroughly conversant with their subjects.

RECOMMENDATIONS.

One of the serious problems in the history of any organization is that of membership. In our own case the great weakness has been in the custom of drawing mainly upon those who take a certain amount of money in premiums at the annual exhibitions. While a few dollars may be saved to the treasury by requiring exhibitors who are awarded more that $10 in premiums to become life members, I do not consider the policy of compulsory membership a wise one.

In many states an important factor in the strength of the state horticultural societies is the auxiliary membership of local societies. It is true that at the present time there are very few such local societies in this State, but I would earnestly commend to the attention of this society the advisability of encouraging the formation of such local organizations and fostering the same in every way possible.

Owing to the increasing importance of a knowledge of the world's progress along the lines of botany and vegetable physiology, as well as in the knowledge of our insect friends and foes, it seems specially important that standing committees be created whose duty it shall be to present to the society each year a resumé of the work done along these lines. I would further suggest that a similar report be furnished each year by the committee on nomenclature and new fruits.

OUR PROSPECTS.

During the past year the fruit-growers have had much to contend with, but the experience of those who have fought bravely the battle against the elements, and against insect and fungous enemies, but more especially against the hold which the customs of the past have upon our practice as orchardists, enables them to see beyond the clouds. The orchardists of Maine are awake as never before to the possibilities of their own calling, and to the importance of doing the right thing at the right time and in the right way.

AFTERNOON SESSION.

The afternoon session was devoted to the general subject of orchard culture. The principal address of the session was,

SOME NEW PROBLEMS IN HORTICULTURE.

HON. GEO. T. POWELL, Ghent, N. Y.

There are certainly problems before us in horticulture, just as well as in other lines of work. The business man has his problems to meet, the manufacturer has his problems continually before him, and this is equally true of us who are cultivating the soil—either as farmers or as fruit-growers. It is because hard problems have been pressing upon us for solution, that we have been passing through this period of depression which has been alluded to in the former addresses to-day; the depression that has rested so heavily over our agriculture. But while this depression has been severe, we have been studying upon these problems, and we have reached the point where we are meeting, now, the solution of some of them. By the very rapid development which has been going on in this wonderful country of ours during the last thirty years, there has developed a great competition in agriculture, and, as the result of competition, there have arisen some of the hard problems which otherwise, would not have to be met. The Eastern farmer, who has been pursuing the raising of grain, has found himself depressed by this competition, and he has been forced to solve the problem of getting larger returns from his labor than by following the old practices once followed here in New England.

The developments in horticulture have been something marvelous during the last quarter of a century. Our country has opened so much territory that we find a rapid extension of the planting of orchards and fruits of all descriptions. Transportation has been so rapidly developed that all portions of our great country seem to be brought closely together, and we meet in Maine markets the products of the far West and the sunny South, side by side with our own.

I was overwhelmed with the planting of apple orchards in Missouri, where a single variety is often found in a block of 100 acres; and there are orchards of 1,000 and 2,000 acres in extent. In passing through these magnificent orchards the question arises, what shall we do, here in the East, to offset this enormous extension of orchards? As we go into our markets we find the Pacific coast is here with us. It becomes an important question, in the future, to know how we are to meet competition which is forced upon us in our own markets from California fruits. The attractiveness of those fruits, the manner in which they are packed and sold, are all of vital importance to us to understand who contemplate planting orchards in New England. Because it is a fact that they are rapidly usurping our position in the Eastern markets. California fruits are to-day leading, they are preferred by the buyers,—perhaps not so much by the consumers—but the buyers prefer the California fruit, and why? Because the California horticulturists have learned the important lesson of not only growing fruit well, of putting it up in the most attractive manner possible.

It was my privilege to stand on the great Erie dock and see a large cargo of fruit sold. It was an important lesson learned, why such an enormous amount of that fruit was sold. I saw, upon one occasion, over sixty different marks of fruit sold in sixty seconds. That is, the different marks were put up and sold and struck off every second for sixty seconds, continuously. It was possible because the fruit was packed so that every buyer knew how it was packed. They knew the quality of the fruit, and when it was offered they had to bid like lightning to get it. And that is the way California fruit is sold.

This brings to us an important question as we contemplate the extending of orchard planting in the Eastern States. That is the question of reorganizing our entire methods. Western orchards are in a high state of cultivation. We can no longer compete with them, but when we plant orchards to-day, we must learn from the Western growers, we must exert our best efforts, our best thoughts, and bring the trees into bearing in the quickest possible time.

How, then, can we shorten the time of bringing orchards into bearing?

I believe that we must recognize, in the planting of trees, the same principles that we recognize in the improvement and development of live stock. I believe that we should recognize in fruit trees the same principles of the law of heredity that we recognize in animal life, and that, if we work upon those principles, it is possible for us to improve our trees and our fruits.

The principles of the propagation of trees have been clearly understood, but I think our practices have not been correct. For instance, in the propagation of trees in nurseries, the seedling stock is usually budded or propagated from the young and growing stock in the nursery rows. The result of this system of propagation is this: We are going to perpetuate in all our trees so propagated the tendency to protracted periods of growth and wood-making. For a number of years I have been experimenting along the line of propagation of varieties, and the growing of trees by the selection of buds and scions from trees that are mature and of unusual merit. The same principle, precisely, that the breeder of live stock follows. Now, in the buds and scions for the propagation of certain qualities which we want in trees, there is as much individuality as there is in live stock. Precisely the same differences in points of quality will be found in trees as will be found in animals. And so, in the selection of the buds which are to be transferred to trees that are to constitute the future orchard, instead of going to the nursery row, where differences in quality cannot be realized, go to the bearing trees in the orchard and there choose the propagating stock.

I started about seven years ago, on this principle with Tompkins King, choosing for stock the Northern Spy tree. The Northern Spy was chosen for the reason that it is a strong and vigorous tree constitutionally. It has great vigor. It has power to resist disease, more so than many kinds of trees. Also power to resist the attacks of insects. In selecting buds to work upon this stock, I sent to Tompkins county, in New York State, where the King apple is known to arrive at the very best condition. I gave directions to select buds from a typical tree; a tree that had a certain characteristic in growth; that, from the nature of its growth would require but little pruning. The fruit must also be typical in character and uniform throughout. Those were the requirements sought for in the selection of buds. Nearly 100 of those trees we top-worked five years ago. They came into bearing in much shorter time than I ever had trees bear before. Buds were selected from those trees to start another orchard. Now, the selection was made again with reference to the very finest. Out of 100 trees I found but two or three that came up to the standard, in form and in uniformity of fruit. And so, out of the 100, the selection was narrowed to two or three. This has been the principle upon which my orchards have been built up, and the results that are now beginning to come are certainly beyond my anticipations. I have selected other varieties upon this principle; for example, the Sutton Beauty. This is an old variety of unusual merit. I am glad to be able to show you, this afternoon, fruit of the Sutton Beauty from a tree which was top-worked but three years ago last spring, and produced, this year, two barrels of apples. (Showing sample.) Here is a portion of the wood. Here are side branches taken from the main branch of a tree top-worked three years ago. And those of you who care to examine this wood will see that the very principle I have spoken of is here wonderfully manifested. Despite the very short period within which this tree has been brought into bearing, it is supplied with a fine development of buds for next year, and when the fourth year comes around it is going to show a magnificent setting of fruit. This is an exemplification of the principle. I have no doubt that we can shorten the time of the bearing of orchards. Instead of running seven, eight, and ten years, the third year has already shown fruit to the extent I have mentioned.

(Mr. Powell shows an apple.) Here is a variety known as the Lady Winter Sweet, which at the end of five years' top-work, has produced more than a barrel of fruit. A number of the trees representing this variety, this year came out beautifully laden with perfect fruit. This is an average of the fruit of the tree. Now this is certainly not only interesting, but it gives a great deal of encouragement to take up the study of horticulture. It gives me an entirely new appreciation of the vigor of the land here in the East. It is not uncommon West. There the climatic conditions are so fine, the soil conditions so congenial, that the trees often show fruit the fourth year, and if, in our northern climate, we can at four years produce a barrel of fruit, and at the fifth year produce two barrels of fruit, we will enjoy that which the western fruit-growers are enjoying.

Now a few words concerning the other kinds of fruits. Plum growing at the East is of importance. The plum is looked upon as a great luxury, and there is no portion of this country where plums are so largely consumed as in the New England States. We in New York depend upon New England as the market for our plums. We recognize the fact that when New England industries are prospering, and when New England mills are running full time, there is no limit to the consumption of plums. So we make a specialty of prune culture. During this year I am putting out something like 500 trees and expect to work them upon this same principle. This is an exceedingly valuable fruit.

The German prune is of high quality, but is of slow growth, and it takes many years for it to come to bearing. The French prune, when grown in California, is of high quality, but it has been supposed we could not grow this prune in New England. It is, however, being grown in New York State. California is shipping hundreds of carloads of prunes to the English markets, and if we compete in those markets we must bring our trees into the earliest possible bearing. If you wish to do this choose a quick-growing tree like the Lombard plum for stock. Use the vigor and strength and the rapid growing habit of the Lombard tree to push forward the rapid development of the prune. I have no doubt in my own mind, that the trees being planted to-day on my own farm will come into bearing in three years. This is our method: We take, for instance, the Lombard plum tree and plant it this fall; or in the spring, where spring planting is more desirable. Next July or August, begin the process of budding. Now the following spring, if the conditions are right, simply cut away the balance of the Lombard wood and you have that tree changed at once into the variety which is so desirable. You also have the hardness, the strength, vigor and vitality of this Lombard plum tree to drive the buds ahead rapidly. I believe the development will be so rapid that the time of getting them into bearing will be reduced three-fourths.

I have here an exemplification of what can be done in intensive peach culture. (Shows branches.) This branch represents the second year's growth, and yet, during this season, strong fruit buds have been developed. The third year, if the winter is not too severe, will show those peach trees in good strong bearing. The trees are from seven to ten feet in height. One branch is of the Wayland variety, and the other the Early Rivers. All of the trees are heavily set with buds. This development is due to a high degree of tillage, showing that when the soil is put into the same condition as that of the Pacific coast, similar results can be obtained.

I wish to speak, at this point, upon another subject before taking up tillage. It is of the influence of fertilization of blossoms. I think we are in the infancy of horticulture. I think we are at the a b c of our lessons. The possibilities that come as we delve into the science, the possibilities that come to us by the study of hybridization and cross-fertilization of our fruits, will give us difficulties that we have not yet realized. And so, in planting varieties, we should study and learn what we can of the effects of cross-fertilization, and of the field open to us to improve our varieties through seedlings. We must build varieties specially adapted to the climate in which we are working. We know of many good things we cannot produce, because the environments are not right, but cross-fertilization opens a new field for building up varieties right upon our own soil, in our own climatic conditions, and so getting new varieties that will withstand the difficulties we find in the severe northern climate.

During last year the conditions during the blooming period were right for the setting of fruit in my own State. We had, during the blooming period, most delightful weather. There was a continuous circulation of the air; there was an opportunity for the insects to work, and every day you could hear the humming of the honey bees. What were the lessons from this? I hold in my hand an apple you will all recognize as the Roxbury Russet. If it were passed through the audience all would say it is a typical Roxbury Russet, and yet it is not a Roxbury Russet. It is a Seek-no-Further. It stood by the side of and very near to a Roxbury Russet tree, and we have in this Seek-no-Further all the striking characteristics of the Roxbury Russet. Without doubt, we have the effect of cross-fertilization. I cannot explain it in any other way. It shows the influence of one variety on another. The lesson is: Do not plant single varieties in great blocks; plant side by side different varieties, for the reason that is so clearly and strongly marked here, that there is advantage in the free circulation of the pollen to improve the quality of our fruits.

Here is another marked influence (showing another apple.) All of you would recognize this as a Lady Winter Sweet. Yet it is not. It has all the marks, but it is a Seek-no-Further. On the other side of the row there was a Lady Winter Sweet, and here you have all the characteristics of the Lady Winter Sweet. They seem almost identical. Put them side by side and you have the same beautiful color as in the Seek-no-Further, which must have been influenced by the blossom of the Lady Winter Sweet, which was near by.

[The question of the immediate influence of pollen in changing the form and character of fruits has long been discussed without definite conclusions. The specimens shown by Mr. Powell, however, certainly were of a very striking character.—W. M. M.]

A few words upon quality, and then I shall take up tillage, on which I wish to lay great stress this afternoon.

As wealth increases in the country the demand for fine things increases. I think we should recognize this fact in the planting of orchards. We should plant those varieties which are going to be most sought after by those who are not only accumulating wealth, but also by those whose employment gives them the privilege of purchasing these things.

Fine quality would be represented in the apple I should select for planting. Take, for example, the Jonathan. It is a beautiful apple, with exquisite coloring and flavor. Here we have two good qualities combined. If we should grow more of this variety, we should solve the question of the large consumption which is so desirable in this fruit.

I speak of this as one of the important problems to study. We should plan so that when we send a box or a barrel of fruit to Boston there will be a demand for that apple, because of its intrinsic value.

The Jonathan is an illustration of choice quality, and whoever buys one barrel will want two. This is the principle on which I would recommend the planting of orchards.

For a short time, I want to speak to you of the importance of bringing greater care to our orchard culture. I find, in going through this State, the same conditions that exist in New York, very much neglect of the apple orchards. You follow the practice of putting out apple trees and then letting them take care of themselves. The future demands a different culture from this. If we are to take our apples into the markets, and hold our position, we must put our orchards into fine culture, and then we can compete with any portion of the world. In the first place we must prepare the ground thoroughly, and then we must give to that orchard continuous culture. We must plant apple trees with reference to growing apples, not with reference to growing hay and potatoes upon that land.

VALUE OF TILLAGE.

This brings us to the object and value of tillage. Tillage has the same importance as the wise selection of buds in propagation. It is closely connected with this idea of bringing about the early bearing of trees. Now tillage does two things for us; it enables us to supply the roots of the trees with the food they need; and to improve the condition of the soil so that plant food is made available. In addition to this, tillage enables us to control, in years of short supply, the water already in the soil. During the past year tillage has been of the most importance to the fruit crop of 1900. The orchards that have stood in grass the past year will be found very weak in fruit buds; but orchards under thorough tillage, in this season of drouth, will be found well supplied with fruit buds, and will probably have a satisfactory crop next year.

Farmers have been discouraged because they have been made to believe their farms are worn out. They are nowhere near worn out. It is true that the fertility in your soil in Maine is sufficient in quantity to-day, to support millions and millions, and the lesson for us to learn, the problem for us to solve, is how to get at this plant food which is so abundant in our soil. We must study and understand not only the plant food, but the action of the water that is essential before the plant food can be made available for the plant. I wish we could look into the soil after a heavy rain has been sending the water down to replenish the reservoirs, and see the action of the water. When summer comes, there begins at once an upward movement of moisture that will be more rapid as the temperature increases. Tillage is one of the important means of controlling and holding in check, this sub-soil supply which, if conserved, will carry most cultivated crops through protracted drouths. Tillage makes the surface soil loose, and gives no opportunity for the water to pass off into the atmosphere, but holds it for the plant we are cultivating.

If I start in the spring-time with a soil full of moisture, I care not if there is no further rainfall, provided I can control the water already in the sub-soil. I have proved it year after year, by growing large crops of apples, pears, and peaches in seasons of drouth. So I have a new understanding of tillage in dry seasons.

In connection with orchard tillage, I have for several years been using crimson clover, and I wish to give you, as rapidly as possible, the actual results that have been obtained by the use of clover for seven consecutive years. I wish to give you the result of building up vegetable matter and bringing to the soil nitrogen, the most valuable food we have to supply. We, in the East, are working under a disadvantage when we are contemplating orchard planting on soil that, for upwards of two centuries has been growing hay, corn, and potatoes, and hence is not in the condition for fruit-growing that it should be. We are at once confronted by this question, How can we bring our soil to the most favorable condition for horticulture? It is a serious matter for us, when we put our hands into our pockets and buy commercial fertilizers. I have been trying to build up the soil in the most economical manner. I once used buckwheat, or rye, and plowed it in, but eight years ago I began sowing crimson clover on my New York farm, and it has brought good results. While speaking to fruit-growers of the economical improvement of the soil, I was asked by a chemist from Cornell, if I knew just what I had been doing. Of course I could give only the general results. The chemist took samples of the soil where three crops of clover had been plowed in, and another of the same kind of soil with no clover in it. He analyzed the two samples. In testing for water he found 15% of the clover-treated land, against 8.75% in the other. At this per cent., on an acre of land six inches deep, which is as deep as we can cultivate in an orchard, he found in favor of the clover-treated land, forty-seven tons more of water than in the other land. Here are two pieces of land, lying side by side, one treated by clover and one not, and the clover treatment made a difference of 47 tons of water per acre.

In testing for humus he found 2.94% in the clover-treated land, against 1.91% in the other.

Testing for nitrogen, he found .21% in the clover-treated land, against .12% in the other. A difference of .09%, or 1,350 pounds in an acre six inches deep. What would it have cost me to put that into my soil? Taking the low valuation of fifteen cents per pound, the lowest cost would have been $200 per acre.

The results may, perhaps, be more clearly stated thus:

	Three Crops Clover.	No Clover.
Water	15.00 %	8.75 %
Nitrogen	.21 %	.12 %
Humus	2.94 %	1.91 %
Phosphoric Acid	.015%	.008%

Available:

Water, 6.25 per cent.—46,875 tons per acre more.

Nitrogen, .09 per cent.—1,350 pounds more per acre.

Phosphoric Acid, .007 per cent.—105 pounds more per acre.

It gives us a new inspiration to find that we can take a plant like clover, and by a few years of free use, so rapidly build up the supply of nitrogen and other vegetable matter the soil needs. I cultivate to the middle of July, and then, when the time comes that cultivation should cease, cover the soil with a growing plant. I choose crimson clover because it is an annual plant, and it grows rapidly, and when cultivation ceases it fills the soil with roots and holds it to the best possible advantage during the winter months. Possibly you in Maine may not succeed as

I have done, but if you will sow the seed from the plants grown on your own land, and repeat the process for several years, the time may come when you can successfully grow this crop in Maine. My first year did not give the best results, but the longer the plant was used in this way, the easier it was to grow it. Now I have eighty acres covered. So continue on, and after several years, if you find it persistently dies, leave it. There is the possibility of so acclimating it that it will be as useful here as in New York.

I hope I have given you some encouragement to go on with orchard extension in your State. I hope I have given you reason to have faith in this attempt, and I am sure if you will follow out high tillage, and select stock as indicated, the acres you plant to trees will give you higher value than anything else you can plant on it. Tillage, spraying, feeding, pruning, selection,—these are the requisites to success in orcharding.

DISCUSSION.

QUESTION: Has Mr. Powell succeeded in carrying a full crop of strawberries under such conditions?

MR. POWELL: I did not touch on small fruits. I will say that I have been applying this system of tillage in strawberry culture to some extent. In 1893, at the Columbian Exhibition in Chicago, a strawberry plant on which there were at one time 243 blossoms, was shown. A great many people doubted the statement, but many counted them and found it correct. I became interested in the possible development of strawberries and began a series of experiments at my place. A plot of land was laid out in 1897, and a crop of red clover was plowed in. Crimson clover was then planted. Then manure was hauled on, and in the spring it was plowed and subsoiled to the depth of 22 inches, and then plowed again. Over ten thousand plants were set, and the cultivator was kept going. Numbers of those plants measured two feet in diameter. What was the result? The development was pressed, of course, to a great extent in the growth of the plant, but some of the plants had as many as 650 berries on them. This shows that the development was carried away beyond anything shown at the World's Fair, and the limit of possibilities is not reached yet.

As to the development this year: The drouth started in April. There was no rainfall to wet the roots of those plants until the whole crop was harvested, so you can see the severe test the work went through for the want of water. Yet, from three-fourths of an acre we shipped 200 bushels of fruit; while about me the berries usually failed. Some picked once or twice, but we picked four continuous weeks on Parker Earle Improved. The other varieties failed right along. Glen Mary, Clyde, Bismarck, and Brandywine, went down after one picking. That is a very rapid outline of what came of this system of high tillage and feeding of plants, during a season the most disastrous of any I ever experienced in strawberry culture.

QUESTION: In top-working trees on Mr. Powell's system can we use scions, and graft in the spring, instead of budding in August?

MR. POWELL: Yes; and I recommend budding in August, and then, if the buds fail, put the scions on in the spring. Always graft if your buds fail.

QUESTION: How about the use of the Ben Davis tree for stock?

MR. POWELL: The Ben Davis is recommended by some people, but I do not believe in it. Any tree so prolific as the Ben Davis is naturally a short lived tree. For that reason I do not want it.

QUESTION: Would prunes be hardy here in our climate?

MR. POWELL: That would be a matter for you to test. For the past year I have raised the fanciest crop I ever produced, and the temperature reached 22 below zero last winter. They can be top-worked on a Japanese plum, but I should use some other variety, such as Lombard, as they are very susceptible to the early spring weather.

QUESTION: Is not the great trouble with plums the black knot?

MR. POWELL: You would have less trouble with black knot if it were constantly cut out.

EVENING SESSION.

Secretary Cook extended an invitation from the President of the Maine Condensed Milk Company to visit the factory on Friday morning; after which a half-hour was spent with the

QUESTION BOX.

QUESTION: Where shall we market our apples and what variety shall we grow?

Mr. POWELL: If I grew Ben Davis I should seek the general market, whereas if I grew Jonathan, Spitzenburgh, McIntosh Red, Gravenstein, Newtown Pippin, or others equally as good, I should seek the first-class hotels, restaurants and families. Taking one barrel, they will surely want more.

QUESTION: What form of potash is best and cheapest?

Dr. TWITCHELL: Experience alone can determine. For cucumbers, tomatoes, strawberries and peas, it has been found that muriate gave large size but soft watery, inferior fruit, while sulphate improved quality. Sources of supply and cost must be reckoned by results in price realized, and in quality rather than quantity of product.

QUESTION: What is the cure for black knot?

C. S. POPE: Have found no relief save by the knife. Some advocate the Bordeaux mixture early in the season.

QUESTION: At what stage should the first spraying be done for apples and plums?

Prof. MUNSON: For the apple scab spray before the leaves come in the spring, usually in April, using one pound of sulphate of copper in fifteen gallons of water. Again, before the leaves expand, spray with Bordeaux mixture. Immediately after the blossoms fall spray again, adding Paris green for the destruction of the codling moth. Paris green can be added to the Bordeaux mixture for the first spraying if there is danger of the canker worm or tent caterpillar. Never spray while the tree is in bloom, as it is liable to destroy the pistil of the blossom and poison the bees. If you are spraying for the fungus that causes the dried fruit that remains on the trees all winter (mummied fruit), use sulphate of copper the same as for apple scab, and then Bordeaux mixture, repeated after the leaves appear. The number of times it is necessary to spray depends upon the season. In ordinary seasons three or four times will be sufficient.

Dr. H. A. Robinson: I think I have almost a specific for the cure of black knot. There is no doubt that the pest is decreasing at this time. We have less to fight. If all the small twigs can be destroyed, and the rest of the knots covered with the preparation, I think they can be conquered, and easily. I have used, for several years, a mixture every ingredient of which is suited for the purpose, but the mixture of the whole is better. It is linseed oil, kerosene, and spirits of turpentine, equal parts of each, mixed together, and to improve it a small piece of rosin. It makes a sort of varnish. This, applied in the fall, will prevent the ripening of the spores, that takes place in the winter. I have usually applied the mixture twice a year. If it is applied but once, it should be in the fall. I have had large knots slough off the trees, disappear and only a scar remain. I think it is a very effective remedy.

THE BEGONIA IN HOUSE AND GARDEN.

Mrs. M. Elizabeth Pope, Manchester.

This beautiful and deservedly popular plant was introduced about a century ago. It is a native of the tropical South American countries, Mexico and the West Indies; and at the time of its introduction the varieties were more curious than beautiful. A careful and systematic hybridization by European florists of these inferior sorts has gradually led up to the magnificent specimens of to-day, the improvement having been specially marked within the last twenty years.

Until recently the begonia has been grown almost entirely as a hothouse or window plant, but now many varieties, especially the tuberous ones, are found to flourish in the open ground.

The begonias are divided into three well-marked classes: The Rex, grown exclusively for its large palmate and highly ornamental foliage; the Flowering, or Evergreen begonias, of the catalogues, which combine beauty of foliage with a very free-flowering habit, and therefore commend themselves to every one; and the Tuberous, whose foliage is perhaps less beautiful, but whose flowers, in great size, substance and brilliant coloring, far outshine all others.

Begonias may be propagated by cutting off a mature leaf with an inch of the stalk attached. Lay the leaf, after having cut through the largest ribs in one or two places, flat in a box of clean sand, with the stem entirely covered. Pin the leaf down to the sand with two or three wooden toothpicks thrust through it, slanting. The new plants will form at the end of the stem and at the points where the pins hold the leaf in close contact with the sand. If your box can have some bottom heat, so much the better for your success. In either case, keep the sand well watered, allowing no water on the leaf itself. Care should be taken in watering the tuberous, as well as the Rex begonias, that no water stands on the foliage.

All the Rex varieties require partial shade. All need a rest of several weeks during winter, where they may be set back

ORCHARD OF C. S. PHINNEY, STANDISH, FALL OF 1899.
View of some of the Spies.

from the light and watered sparingly till the lengthening days call them to a more vigorous life.

The dry tubers from the florist are likely to be the most satisfactory to the ordinary grower of the tuberous sorts. They may be started early in the spring in flat wooden boxes filled with sand, the tubers to be placed about an inch apart with the tops barely showing. Water well and set in a good light, but not where the hot sun of mid-day will strike them directly. When the tops have made a growth of half an inch, lift carefully from the sand, and if they show an inch or so of fine fibrous roots, they are ready to pot into a rich, loamy soil. The pots should be large enough for the flowering plants as the brittle shoots are likely to be injured in re-potting. They grow more stocky in a lower temperature than some other begonias—50 or 60 degrees being sufficiently warm—and partial shade is desirable in all stages of their growth.

For window culture they may be set directly in a well prepared border or left in pots which are sunk in the ground. The latter method has the advantage that one can easily regulate the water supply, and the tubers are already in pots where they may remain until it is time to start them for another season's growth. I omitted to say that when the tops show signs of decay, water should be furnished more and more sparingly until the stalks drop from the tubers, when the latter may be set away in a cool, dry place, where there is no danger from frost, and kept perfectly dry until spring.

While tuberous begonias are grown primarily for flowers, they are rendered much more attractive by a setting of foliage, always good, and in many varieties strikingly beautiful. It shows many tints of green, is often beautifully shaded, and presents a rich, silvery surface.

The color of the flowers varies from pure white to pink, scarlet and crimson, from palest yellow to deep orange. Among all the begonias, purity of color is a striking feature. Not only are there no ugly colors, but there are the most exquisite tintings and shadings in the light colors, and the most brilliant of scarlets and cardinals.

In the single varieties, as in the flowering begonias, the large pistillate flowers succeed the staminate. The double flowers are very large, and, as in the geranium, they are much more enduring than the single ones.

While the begonia may be somewhat exacting in its demands, these are readily learned, and it fully repays all care. When we take into account the beauty of the foliage, the great size, delicate texture and exquisite coloring of the flowers, I know of no plant more thoroughly satisfactory to the amateur.

BOYS AND FRUIT.

Secretary ELIJAH COOK, Vassalboro.

I am always glad to have an opportunity to speak a good word for the boys before almost any audience; and I am particularly pleased, to-night, to have the privilege of addressing this large and intelligent audience upon a subject so dear to my heart. We are anxious to increase the herd, to increase the flock, to increase the products of the farm in every way; and yet any one of these is secondary to our duty to, and interest in, the boy and the girl. We are anxious, to be sure, that they shall have broad, well-developed minds; that they shall have strong, vigorous bodies. But it is infinitely more important that they shall have strong characters as well. What advantage to the world though your boy may have the mind of a Webster, and yet be controlled by the lowest character? Environment does much for the proper building of character in the boy and the girl. I shall have to be careful to include the girl, for when we think of the grand opportunities before the boy in this wonderful age, we must remember that the opportunities are just as grand before the girl.

How many lives are wasted for the want of something to encourage and inspire action, and how little it takes, sometimes, to accomplish the change which will make life a success! We cannot be too careful in regard to the environment, in regard to the influence brought to bear upon the boy and the girl. Be careful of their reading and teach them the way in which the great characters of history were built up.

The subject for to-night was Boys and Fruit, suggested to me by the president, and naturally they make a good mixture. How much there is suggested in the way of properly developing the boy, in the cultivation of fruit! A young orchard properly cultivated, tilled and enriched, will accomplish much in making the boy in love with the farm. Keeping the boy on the farm is a grand work, for where, I ask you, in all the world can be found an occupation better adapted to develop all that is acceptable in the young man, than farming, properly conducted? And the fruit comes in here with tremendous importance in this direction. What can you do on the farm that will add more pleasure to the family, more satisfaction to all concerned, than the proper cultivation of fruit?

As an illustration, let me refer to a man at Skowhegan who owns an orchard of Northern Spies. For the past eight or ten years he has sent from eight to twelve barrels of apples, of these Northern Spies, to Boston every year, and he has not received less than $8 per barrel in any year. Faced on the bottom of the barrel, faced on top and clear to the head, with large beautiful apples, highly colored, and nearly all of one size. The sight is indeed a glorious one. When such fruit reaches Boston there is no difficulty in getting almost any price. In order to secure these high prices we must produce better apples. How are we to do this? When you hear of a large crop of corn reported, you know that the ground must have been properly prepared, enriched and tilled, all through the season. Just so with the orchard. We cannot neglect it and get any satisfaction out of the business. How do they raise oranges in Florida? By setting trees on some worn-out land and then neglecting them? No. There is no success in that. They buy land under the most favorable conditions, situated by a lake or river, covered with forest. Often it is land costing $100 per acre. They cut off the forest, clear the land, set the orange trees, and then a man and a mule work year after year on each acre. If such an orchard is neglected for two or three years, it results in the loss of nearly the whole plant. If we should undertake orcharding here in Maine on that scale, investing anything like what they do with the orange grove, and give equal care, what a wealth could be obtained.

Now we are all anxious about the boy, more than all else combined. We have thoughts of leaving something to him when we go over the river. How better accomplish this than by setting a young orchard, and adding to it year by year, cultivating it, enriching it, and having the boy interested in it all times. Such an orchard increases in value and becomes more productive every year, and we are sure of our opportunity to leave something valuable to the boy; surer than we can possibly be in the bank account. It also adds much to the genuine interest of the whole family upon the farm to have an abundance, and to spare, of those luscious fruits of the orchard. But that is not all. The small fruit comes in for a share. How many farmers here in this section raise strawberries, raspberries, blackberries, currants, and gooseberries enough to furnish the family all the year around. If you do not do it, what a grand change it would be to undertake it in the future. What a difference it makes to the wife if she has this abundance of fruit for three meals each day! Not only through the berry season is this true, but in the cold winter as well. No matter what it costs, fruit is a necessity in the home and will pay for itself many times over. It will help to keep the doctor from the door. It will help to make the child pleased and satisfied with the home.

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What are you living for? A man told me the other day, that he was living to get a little bread to eat. God forbid that any of us should be living simply to eat. Let us eat to live! Let us have some thoughts higher, nobler, and grander, than simply to accumulate the almighty dollar. Get something out of life as you go along. It is not the man who accumulates the most wealth who is the richest. Let us go home from this meeting, determined that as for us, let others do as they may, we will take better care of the orchard, produce better fruit, and make the household happy.

FRIDAY, NOV. 17—MORNING SESSION.

The morning session was devoted to the annual business meeting, a report of which may be found on page 14.

AFTERNOON SESSION.

The fifth session was opened with music by the grange choir, after which the following subjects were presented:

PEARS FOR NORTHERN MAINE.

Dr. H. A. Robinson, Foxcroft.

A line drawn east and west, in extension of the southern boundary of Piscataquis county, would divide this State into two about equal portions. South of that line, I believe that most of the common kinds of pears can be grown with a fair degree of success; but north of that line the case is different. It is difficult to make the young trees live, and if some few live they grow very slowly. The trees are often very defective, wounds remain unhealed, the young wood is badly stained by the cold of winter, the trees blossom little and bear less; so that the effort to raise common pears in northern Maine and in northern New Hampshire and Vermont as well, is hazardous and unprofitable. Under these circumstances, what can be done to have pears?

In 1870 the U. S. Department of Agriculture introduced into this country some of the hardy fruits of Russia. Later, in 1882, Prof. J. L. Budd, of the Iowa Agricultural College, and Mr. Charles Gibb of Abbottsford, Canada, spent four months in inter-continental Europe, examining hardy fruits. They found apples, pears, plums and cherries grown in abundance and in many places in profusion all through central Russia, and as far north as Simbirsk and Moscow, latitude 54 to 56 (ten degrees north of this), where the temperature at times is 50 degrees below zero. There they made arrangements for introducing the best of these hardy fruits into this country.

Of pears, there were two types, the "Grucha" and the "Bergamotte," which seemed equally hardy, sometimes making large trees fifty feet in height and two feet in diameter. They were very often planted by the wayside as shade trees; the pear being a very long lived tree, sometimes reaching the age of one or even two hundred years. There were also many wild pear trees, which appeared to be indigenous.

The Grucha type of pear is pyriform, having a neck similar to our ordinary pears, while the Bergamotte is nearly round and is thought to be of Mongolian or Chinese origin. It is not to be expected that these pears, with a habitat in this cold climate, are so large or so fine in quality as our common pears, which came from western Europe. But they will do very well where others cannot be grown.

Professor Budd finds the most of the trees hardy in Iowa and Minnesota.

Dr. Hoskins, of Newport, Vermont, who lives on the highlands bordering Canada, in a climate where common apple trees freeze to death and only the varieties known as "iron-clads" can exist, wrote me four years ago that these Russian pear trees were bearing with him at the age of seven years from the root-graft; that they bear early, and that they are apparently as hardy in his severe climate as the maples and birches of the forest. Mrs. Hoskins writes me recently that their original Russians, now eleven years old, are fine stately trees, early bearers, and heavy yielders; good edible fruit on most of them, and all fine for canning. They should be gathered before quite ripe—as soon as the seeds are well colored, and before if they fall much. She states that they have some thirty trees on the home place, and over 100 on the farm.

Two years ago I visited a half dozen of these trees on the grounds of Mr. E. W. Merritt, of Houlton, Aroostook county. These trees had been set five years, I think. They looked thrifty and were bearing well.

I have also in my own place a few of several varieties of the Russians and others; some two, three, and four years set. The latter are already blossoming and bearing fruit. The Bessemianka, Lutovka, and Gakovska are among the hardiest. Other kinds that I have are Sapieganka, Limber Twig, Early Bergamot, Flat Bergamot, Sacharine, No. 439, Orel No. 15, Mongolian No. 5, Mongolian Snow, Japan Golden Russet, Japan Select, etc.

The Mongolians are not so hardy as the Russians, and the Japans still less so—perhaps not hardier than the Flemish Beauty and Clapp's Favorite—but their growth is thrifty, and their leaves have the beautiful, glossy, luxuriant appearance of the hybrid pears, Keiffer, Garber, Idaho, and Le Conte.

I will give a brief description of some of the more common varieties of Russian pears. First and most widely disseminated is—

Bessemianka: Fruit medium in size and nearly or quite seedless. Flesh tender, juicy, sub-acid, almost buttery, and very satisfactory for dessert use. Season last of August or first of September.

Gakovska: Very hardy. Fair quality. Valuable for cooking and canning. Season, September.

Lutovka: Very hardy and a very fine tree.

Sapieganka: Medium size, nearly round, tender, juicy. Tree not quite so hardy as some of the others.

Limber Twig: Similar to Bessemianka.

Early Bergamot: A fine, healthy tree, hardier than the Wealthy apple. Early summer.

Flat Bergamot: Like the preceding, but later. September.

Mongolian Snow: Hardier than the Flemish Beauty. Leaves always clean, handsome and perfect. Fruit above medium in size, and when ripened in the house better in quality than Kieffer, Le Conte, etc.

Sacharine: This appears to be identical with the Zuckerbiren (Sugar Pear) of northern Germany. It is as hardy as the Wealthy apple. Fruit Bergamot shaped, tender, juicy, nearly melting, and sweet. Season early September.

Dr. Hoskins, in *American Garden,* says that "the northward range of pear culture on the Atlantic slope does not anywhere extend north of 45 degrees, except in Michigan, and in the low valley of Lake Champlain, extending northward to Montreal. A line drawn westward from Bangor, Maine, bending in a long sweep southward of the White Mountains, to Lake Champlain at Burlington, thence to Montreal, will mark the northern limit of pear culture." This has reference, of course, to the common varieties of pears, and was written before his acquaintance with the Russians.

There is an average difference of one day for every eleven miles of latitude, other things being equal, in the ripening of fruit. I think, however, but few of our people realize the great difference there is in climate in the different sections of the State; or, that to the ordinary difference made by latitude, must be added the difference made by general elevation.

Every three hundred feet of general elevation of a section of country is said to be equal, in climatic effect, to one degree of latitude; so that here at Newport must be added, probably, the effect of about one degree; at Dover and Foxcroft, a degree and a half; and from Blanchard and Monson to Moosehead Lake and northward, the effect of three or more degrees, to the actual latitude.

Of course, this does not apply to abrupt elevations in a place of general low level, since it is well known that these elevations are the ones to be selected as sites for orchards of tender fruits, the cold air settling down into the valleys. But we have reference to the general level of the country.

I fully believe that the Russians will supply the northern part of the State with pears, if only they are planted and cared for; but "success comes only to those who seek it."

A few of them can now be had from some of the general nurseries. Bessemianka may be had from most of the leading nurseries. Gakovska, from the Sioux City Nursery Co., Sioux City, Iowa; Mongolian Snow and Japan Golden Russet, from the Silas Wilson Co., Atlantic, Iowa. The latter variety bears so young that it sometimes fruits in the nursery row. Limber Twig, Sapieganka, and perhaps others may be had from the Fonthill Nurseries, Fonthill, Ontario.

There ought to be a general waking up of the people of northern Maine in regard to this matter of hardy fruits. It is recommended that pear trees be cultivated for about four years, and then that the ground be seeded to grass. But as the trees grow so much more slowly here. I should recommend that the cultivation be continued a year or two longer.

ORCHARD OF C. S. PHINNEY, STANDISH, FALL OF 1899.
View of some of the Baldwin trees.

DISCUSSION.

QUESTION: What is the best pear for northern Maine?

DR. ROBINSON: Bessemianca has been the most disseminated and is a hardy tree. Ludovoska is also a good one.

QUESTION: Would Flemish Beauty stand the cold weather?

DR. ROBINSON: It grows in our climate, but is by no means a hardy tree. It takes it a great many years to become a tree of any size.

QUESTION: Is there any way whereby the cracking of the fruit can be prevented, by spraying or otherwise?

DR. ROBINSON: That is a very desirable thing, if it can be found out. I have seen mulching recommended. Alfred Smith recommended that, years ago; but whether effective or not I do not know. I doubt if it is. The theory was that it kept the ground moist and so more favorable to the development of the pear.

PROF. MUNSON: The cracking of the pear is caused by a specific fungus, and we know that this fungus is best controlled by the use of the Bordeaux mixture, which was recommended, last night, for the apple scab, and for other fungus diseases. There is no doubt that with careful, systematic, application of the Bordeaux mixture, we may grow the Flemish Beauty. At the Experiment Station this year, some of the finest specimens I ever saw were grown. They were sprayed with Bordeaux mixture before the buds swelled, and two or three times afterwards.

MR. TRUE: The Flemish Beauty proved, with me, very free from that growth, this year. I may further state I have seen, in Aroostook county, Flemish Beauty growing finely where they thought they could grow no fruit. This was 12 or 15 years ago.

STRAWBERRIES—HOW TO OBTAIN A PROFITABLE CROP.

E. W. Wooster, Hancock.

The first thing to be considered is the selection and preparation of the ground. If greensward is to be used, and the sward is very heavy, on rather low land, it should be planted to some hoed crop and given clean culture for two seasons before setting strawberry plants, to kill the weed seeds and clean out the white grubs, which are almost sure to badly infest such grounds. The best hoed crop to grow on such ground, as far as the advantage of giving clean culture is concerned, is the potato; but the fact that it is a heavy feeder on potash, like the strawberry, must be borne in mind. The best selection of ground, however, that can be made for the strawberry, is that which is taken "right from the green stump." The first cost of fitting such ground is great, but the first year's fruiting will more than repay the extra cost.

Ground should be selected from both up-land and low-land when possible, and of a nature to suit the variety of strawberries to be planted; or, when more convenient, select your variety of strawberries according to your soil.

Such strong growing varieties as the Crescent, Beeder Wood and Warfield, do better on upland shale and rocky soil, while such shy running and heavy foliage varieties as the Bubach, Glen Mary, Ridgeway and Parker Earle do better on heavy soils.

When fitting the ground for the plants, perfect drainage must be carefully looked after. On low, flat land, both under drainage and surface drainage must be given; on up-land good surface drainage only is necessary, that the water during the time that the earth is frozen may pass off quickly, before it freezes and smothers the plants. The ground should be back-furrowed into narrow beds like a good road-bed—the highest part in the middle. The kind and amount of fertilizer, as well as the time of application, depends largely upon the condition of the soil, as to its natural richness, and upon the varieties of strawberries to be planted. This question of fertilizing is one of the most important, and at the same time most difficult, to be considered in the culture of the strawberry. Upon its correct solution depends the profit of the business.

I depend almost wholly upon commercial fertilizers and chemicals and new soil. Fifteen years of experience has taught me that for fruit, these are much better than stable manure, but if I were growing plants more exclusively for market than for fruiting, and was after quantity rather than quality, stable manure would be just the thing. All varieties require much potash to give them high-colored fruit; the softer the variety the more it requires.

The variety should be selected from those that are known to succeed well in the locality, and selected from the earliest to the very latest, so as to make the season of fruiting as long as possible. The plants should be selected from the very best high-bred stock that can be found nearest to your locality. There is no necessity of their being the so-called "Pedigree" plants, but the plants from which the runners are taken should not be allowed to fruit on that season, as they will need all their strength even with the special culture, to form the best plants. Plants that are forced by an excess of nitrogen and water into a rank top-growth, and allowed to mat thickly are not fit to set. I set thousands of plants every year that I could not afford to sell for ten dollars per thousand, because they would pay me much better than that to let them remain where they grew to fruit; but experience has taught me that I could not afford to set plants of less value. Unless the season is well advanced it is not the best plan to set the plants at first where they are to remain. They should be taken up as early in the spring as the season will permit, all the old foliage trimmed off, the roots shortened to about four inches, and healed in in rich, fine, dry soil. Dig a trench five inches deep a little slanting on one side, against this slanting side lay the plants about three inches apart, with the roots spread out fan-shape, press the earth against them firmly. Then, six inches from this row, dig another trench and proceed as before. In doing the work, be sure that you get the crowns of the plants all even with the top of the soil, and that the roots are wet with muddy water. Plants so treated can remain, if necessary, for more than a month before being set in the open land, and will not stop growing in the least when re-set. While in the beds they should have plenty of water till a few days before they are to be taken up, when they should be kept dry to the point of almost wilting. When taken up they should be dipped into water and planted at once. Plant them in the field in rows three feet apart, and from one and a half to two feet apart in the row. Cultivate and hoe often, allowing them to form very narrow matted rows, treating all extra plants as weeds.

Never undertake to prepare your ground in the spring till it is dry enough to work up fine. The last of June is not too late to plant strawberries in Maine, if planted the way here described. As fine a bed of strawberries as I ever grew were planted on the second of July. My advice is, however, plant as early as possible in the spring.

A little phosphate containing a large per cent. of nitrogen, should be scattered along the line of the row and well raked in, and after the plants are set, scatter a great spoonful in a ring around each plant, about six inches from it. This phosphate sowing should be repeated some half dozen times during the growing season, but after you have got all the plants you wish rooted, then a brand should be used that contains more potash; and at the last application, late in the fall, muriate of potash at the rate of 250 pounds to the acre, should be used. Never sow chemicals when the foliage is wet or allow any to long remain upon it at any time.

Keep up cultivation till the ground freezes, and then cover with straw, thatch, swamp hay or moss. It is a little dangerous to put moss directly over the plants, unless put on very late and removed by the time that the frost is out in the spring, but it makes a good mulch. Snow is Nature's protection, and of course the very best while it is in place; but it is never reliable along the seacoast, even in its season. Evergreen boughs make the safest artificial winter protection.

In the spring the evergreen boughs must be removed, but the mulching material may be allowed to remain, except over the plants where it should be loosened up, and where too heavy, a part of it removed to the alley-ways. The whole surface between the rows should be mulched for four very important reasons: *First,* it preserves moisture to the soil by the arrest of capillary action. It also prevents the soil from washing badly and from being beaten down hard from the effects of heavy rains, thus allowing more water to pass into the soil during the refreshing summer showers. *Second,* it keeps the fruit from coming in direct contact with the earth, thus keeping it free from grit. *Third,* it keeps down the weeds. *Fourth,* it greatly lengthens the fruiting season. By mulching, the crop will be much larger, the berries will average larger and more beautiful, and consequently will bring a higher price.

Now we come to what I call the commercial department of fruit growing. The most important human requirement is the pleasing of the eye, and strange as it may seem, taste is among the last requirements with the majority. As far as the strawberry is concerned, size and color are all essential. To make these large beautiful berries more pleasing to the eye, they should be carefully graded and put into clean new packages. Every package should be so graded that your name upon the package will stand as a guarantee that the package contains just what is marked thereon. In doing a business of considerable extent, in order to insure this, you must train your pickers very carefully. You must thoroughly educate them up to the mark of proper grading, and thoroughly impress upon their minds the fact, that in working for the interest of their employer, they are also working for their own interest. You must weed out all those who will not appreciate the advantage in doing this; stimulate the best work by giving extra pay for extra work done. Pay off your pickers once each week. Establish a line of customers whose business methods have given to them the best trade and they will appreciate your efforts in trying, through them, to satisfy the requirements of that trade.

DISCUSSION.

PROF. COOK: I had heard a good deal about Mr. Wooster's strawberries. I had talked considerably about them; but last spring I went down to view his plantation, and I assure you that the half had never been told. It was a sight that pleased me through and through. No weeds at all. All his vines, upon some five or six acres, in admirable condition, making use of what we were told they did, in regard to constant tillage, so that he didn't need water. All of this, to me, was one of the grandest sights I had ever seen. I have seen a great many strawberry beds; I have seen a great many different strawberries, but never anything equalling Mr. Wooster's plantation down on Hancock Point.

QUESTION: I would like to ask Mr. Wooster which variety he grows gives the best results.

Mr. WOOSTER: Sometimes I like one variety a little better one year, and sometimes another. The list changes every year. Sometimes a new one comes along in which I think there is an improvement. I find, perhaps one in fifty, that is an acquisition. I drop the poorest. It is a great disadvantage to have many varieties to care for. About 95% of my ground is occupied by five varieties. The rest I am experimenting with. The variety must depend somewhat upon the soil. For the earliest varieties I have kept, for a long time the Haviland. I have a seedling that I think is earlier, but it takes years to demonstrate that quality. There is another early variety that I shall plant next year. That is the Clyde. It has its difficulties. It is one of the poorest berries for wet weather I ever saw, but in dry weather it is good. It is prone to over productiveness. My greatest producer was Parker Earle. This is a late variety but is very productive. On 1 1-10 acres I gathered, approximately, 14,000 quarts. I commenced to pick on that bed the 14th of July, and the last picking was August 15th—a month on that one variety.

I commenced to ship berries the 23rd of June. I commenced with the Hawaii (one of my own seedlings), a few scattering Clydes and Leavitts. I closed with Parker Earle. The Bubach has been my leading variety. I have received more money from that variety during the last three years, than from any other.

CURRANTS AND GOOSEBERRIES.

A. A. EASTMAN, Dexter.

The frost and the drouth of the present season may lead some of us who are engaged in small fruit culture to look on the dark side and to feel that we have more to contend with than any other class, and in view of this state of things perhaps it would be well to recount some of the advantages of our occupation, and possibly we may find that we have more to encourage than we ever before thought of. Even when things were most prosperous it was natural for us to magnify our difficulties and drawbacks and forget our advantages. Let us now reverse this order and for the time being put aside all our discouragements and consider some of the reasons why we should congratulate ourselves that we are fruit growers.

Fruit growing does not require as great an outlay of physical strength as other modes of farming. There is but little hard work connected with it and for this reason it is a suitable occupation for those who are not able to engage in farming, market gardening, or any employment which involves much hard work. Old men, women, invalids, and children, may spend their little strength in fruit growing and be successful.

Small fruit plants are set out for a special work; that is, to send their roots through every inch of the soil in search of plant food and, having found it, to change it into fruit. Our part is to prepare the soil, set out the plants and see that they have the best possible care to do their work.

As a rule currants and gooseberries are largely overlooked by our fruit growers and farmers; not cultivated at all. They are, however, worthy of a place in the small garden as well as the larger. The fruit can be used in a green state or when ripe, and does not require a great amount of skill in growing.

The habits of growth of currants and gooseberries are very much the same, and they require the same treatment in their cultivation. They are northern fruits, which absolutely refuse to do their best in a southern climate but there is no fruit grown with us that will respond more quickly to first-rate care and cultivation. They are the only ones of our garden fruits that will endure our most severe winters and come out in the spring without a damaged bud.

In selecting ground for these fruits a moist piece, well underdrained is desirable. If your land is in the sod, plow and till, with a hoed crop, one season. When the crop is off in the fall, about the first of September, prepare the ground. Have it rich, mellow, and in good shape.

In setting out plants, use a garden line so as to have your rows straight, and set the plants in rows six feet apart, and in the row five feet apart. The first two years after the plants are set out you can plant corn or other hoed crops.

In setting currants and gooseberries, set them deep in the soil; they will not bear fruit unless you do it. In setting the plants in the hole, fill partly with soil and then put in some old dressing, and then cover over this dressing with soil two or three inches.

By setting in the fall, say in September, a great deal of time is saved, as new roots will grow until the ground is frozen deep, and in the spring they will take hold and grow and you will hardly believe the plants were moved in the fall before.

Currants and gooseberries are gross feeders and if you want to get a large crop you must feed for it. Use barn dressing and be very liberal with it. This will pay better than a small dose which means a small crop of fruit, poor in quality and poor in price also.

For mulching fruits I use straw, swale hay and forest leaves. All are good, but swale hay lasts longer than straw or forest leaves. Forest leaves will keep down the weeds better than any other mulching however; but you must be very liberal with mulching in order to get any benefit from it.

In preparing for winter protection, first, we do the pruning; cut out the old wood and a part of the new suckers—leaving from two to four on each bush. You get the best fruit from new wood and young bushes. After this work is done, tie them up or draw them together with a string, to keep snow and crust from breaking them down. In the spring cut the string and let them loose for their summer's work.

As a poison, for the currant and gooseberry worms, I use London purple. I like it the best. It is light; it does not sink in the water like some other poisons; it is cheap, and a pound will go farther than twenty pounds of hellebore. I mix a pound of purple to about two hundred and fifty gallons of water and use it in a knapsack sprayer. One or two good sprayings will put a stop to their bad work. You must keep a sharp lookout for the worms or they will strip your bushes in a short time and the fruit will be small and poor.

Some of the later kinds of currants and gooseberries are the ones to raise, I think, but many others are good. For market we must raise that which sells best, and brings the most money with the least expense and labor. Of the currants, for market, I think the Fay's Prolific takes the lead; but for family use we like the White Grape. This variety is nearly as large as the Fay and very much sweeter.

For gooseberries I like the Downing. This is a heavy bearer and sells in the markets as well as any kind that I know of.

Currants and gooseberries come into bearing at three years old, and will bear fruit for many years, with good care; but I can get what there is in them in from six to ten years by dressing them heavily. We get the best fruit, and largest crops, from young bushes.

In propagating currants and gooseberries by cuttings, take the tips of new wood six inches long and stick them down in the soil the whole length in a rich place in the fall. When the freezing nights come, cover them up with some coarse dressing or boughs for winter. In the spring take off the boughs, but leave the dressing. Gooseberries will not readily root from cuttings, but you may bend a cane down and cover it with dirt when it soon takes root. After one season's growth transplant it where desired.

DISCUSSION.

QUESTION: What time would you spray the gooseberry for the worm?

Mr. EASTMAN: Just as soon as you see the worms at work. It will do no harm if you go all over the bushes. Give them a good spraying. We find the worms at first, on the lower parts of the bushes. As they grow larger, they go up.

QUESTION: What is the best currant for home use, and what the best for marketing?

Mr. POWELL: If I were to be confined to one variety of currants for home use, I would choose the White Imperial. It would not suit the ladies quite so well, largely because the color of the white currant is not so beautiful as that of the red. But the White Imperial is one of the sweetest and richest varieties that I know. It is exceedingly luscious. For market purposes I would hold very closely to Fay's Prolific. This is a beautiful red currant, large in size, with long stems, and it brings the highest price in the market.

There is another variety known as the President Wilder. While the fruit is nearly as fine as Fay's Prolific, the bush has an upward growth, and the fruit is well up. Fay's Prolific has a drooping growth, and the canes are liable to be split down in winter.

EVENING SESSION.

In the evening, as usual, considerable time was spent in the informal discussion of subjects found in the

QUESTION BOX.

QUESTION: What are the best raspberries for general culture?

Mr. WOOSTER: For quality of fruit there is nothing that will exceed the Cuthbert. The Golden Queen is identical with the Cuthbert in quality. For commercial use grow the Golden Queen. (The wisdom of this recommendation is doubted because of the color of Golden Queen.—W. M. M.) The Cuthbert will not ship. Ship your raspberries in large packages, requiring two men to handle them, and they will fare better than if sent in smaller packages.

I cannot see any difference between the Columbian and the Schaffer. I do not think much of the Columbian, as far as quality is concerned. Many would declare that the berries were mouldy; but some accept the fact that it is the nature of the berry. I have quite a trade in this variety. It is one of the hardiest varieties I grow. In some places they winter-kill. But it is a mistake to think they winter-kill from the cold. The trouble is in starting too early in the spring.

Mr. EASTMAN: My experience, in winter-killing, is that when the warm days come and are followed by cold nights, then the plants winter-kill. But if they are fastened down, they will come through all right.

Mr. WOOSTER: Let the ground get thoroughly frozen around the roots of the bushes, then cover with mulch and they will not winter-kill. Let the frost be late in getting out of the ground in spring, and they will not winter-kill.

QUESTION: At what price must apples be sold to repay the expense of growing?

Mr. POWELL: That depends very largely upon the yield you get from your trees. I have known seasons when apples sold at the station for fifty cents per barrel, and at that price were the best paying crop on the farm. The yield was good. One year with another, 75 cents to one dollar per barrel, for the fruit, not including the barrel, will pay all expenses and leave a handsome profit.

QUESTION: What is the average cost of evaporating apples and what price should we expect in the markets?

Mr. POPE: I can simply say that with a small evaporator, with a capacity of fifteen or twenty bushels a day, the cost of evaporating would be four or five cents per pound. A bushel of fruit will make five or six pounds of evaporated apple. Any one can make the reckoning on the profit. The price ranges from five to fifteen cents per pound, depending upon the year, and the quality of the fruit. Three years ago apples were very low, and evaporated apples brought about five cents per pound. The next year they sold readily for twelve to fifteen cents per pound, where the work was done nicely. If your apples are selling for twenty-five cents per bushel, there is no money in evaporating fruit.

Replying to a query as to the difference in varieties, Mr. Pope said: I cannot say which variety is best. Apples picked quite early,—those that blow off early in the fall,—make the whitest fruit, and the dealers prefer them because they are quite acid. Our Maine fruits, Baldwins, and other quite acid varieties, are more sought after in the Boston markets than the western, because, when the apple is evaporated the quality they seek after, the acidity, is reduced. Therefore the sourer the apples are, the better the fruit will be, and the more sought after. The early fruit will be the whitest and the sourest. The wind-falls are not a dead loss because they make the whitest evaporated fruit.

QUESTION: Will Mr. Powell give his manner of cultivating the cherry?

Mr. POWELL: The cherry requires a good soil, not too rich, but a soil that would produce a good crop of corn. It should stand on high ground where there is a good circulation of the air, in order to avoid the root fungus that is so disastrous in growing cherries.

The cherry orchard should be kept in clean culture for six or seven years. After that any full bearing cherry orchard could be seeded down and left in sod. To stimulate production do not make the cherry tree too luxuriant. The cherry orchard would be the exception to all other orchards in regard to standing in grass.

I can hardly recommend varieties for your climate, as I do not know enough of the conditions. I should think the sour cherries would be much better here. The best are the Early Richmond, which is a very early bearer, and a vigorous tree. Next to the Early Richmond would be the Montmorenci, which is another hardy tree and a fine fruit. It is an exceedingly rich cherry canned. There is another variety of sour cherry, the English Morello. The fruit is astringent, and not as fine in quality as those mentioned.

Among the sweet cherries, I am growing the Black Tartarian, also the Napoleon Bigarreau, which is a beautiful cherry. The Downer is a red cherry, and very hardy, indeed. It is possible you could grow the Downer in Maine. If so it would be a luxury. The Windsor is a hardy, rich cherry. I do not know whether or not you can grow it in Maine. It could be shipped from here to California. It is thick-skinned. It is a trifle new for general recommendation, as is also the Dikeman. This last named variety comes on, with us, after everything else named is gone. This would be a very valuable cherry for you if it would withstand your climate.

The Yellow Spanish is a fine variety, but somewhat tender. It is a beautiful cherry, exceedingly rich; one of the finest when canned, but with me it does not withstand the winter. The Gov. Wood is a tender cherry, but an excellent variety.

When you plant cherries, plant two or three extra trees for the robins. I make that my practice in planting cherries. I put out such as the Gov. Wood for the birds.

Mr. ATHERTON: Something has happened to the cherry trees in Hallowell by which they are all dying. All die down in one winter. Perhaps the gentleman has had something of a similar nature in his experience. In regard to the Black Tartarian, I have some of the trees and they have something exude from them that injures the tree.

Mr. POWELL: Very frequently we lose trees from sun scald. We have a few days of bright weather and, though the ground is frozen, circulation will be stimulated, and then comes freezing. Where sun scald takes place, you will have the exudation of moisture. It is a peculiar condition that comes from the rising temperature. I have lost numbers of trees from the very same cause. I should say sun-scald was the trouble with your trees.

Mr. TRUE: I think it is well brought out that the cherry has not done well in Maine, except in favored localities. If others differ I would like to hear from them, for I think a great outlay in the finer varieties would prove a loss.

Mr. WOOSTER: I have lost a number of trees out of the hundred I had originally. Of the varieties mentioned here I have some that succeed with me. The Montmorenci is one. The Early Richmond has not been successful with me. The Gov. Wood is a beautiful, ornamental tree. I get a few cherries by taking them before they are ripe. They seem to be hardy. I have some other varieties. The Ostheim is very hardy, but a miserable growing tree. The conditions do not seem to favor it.

QUESTION: What shall we do for the rust and mildew on currant and gooseberry bushes?

Prof. MUNSON: Spray with Bordeaux mixture for the rust; with sulphide of potassium (liver of sulphur) for gooseberry mildew.

QUESTION: What is the best gooseberry for the market?

Prof. MUNSON: The Downing.

EXPERIENCES WITH CATERPILLARS.

CHARLES S. POPE, Manchester.

If we are to raise fruits we must fight the insects, and just at this time, particularly, the caterpillar. We all know, to our sorrow, what we have had to contend with in past years.

Twenty-five years ago our orchards were infested by the canker worm. It never was heard of in our section before, although in Massachusetts the orchards had been stripped for years. We fought it as best we could, and succeeded pretty well, after two years' fighting. The very next year the forest tent caterpillar made a raid the same as they did last year and the year before. In our old orchard we were unable to fight them, and the orchard was completely ruined. At that time we learned how it was possible to keep the caterpillar out of the tree when we once cleared it, and in that way we were able, when they made a raid two years ago, to fight them successfully from the beginning.

We knew nothing, then, of spraying with Paris green. After sweeping the caterpillars from the tree they would fall down and then start for the tree. As soon as they struck the trunk they were up and at it again. In some way we learned that they would not cross a band of grease. The next question was, what to put on for grease that would not run in the sun. It was discovered that a mixture of lard and sulphur was the best. We tried tar and printer's ink, but in a few days that mixture would dry. By mixing sulphur with the lard it would not run. To keep the mixture from the tree we put on oil-cloth carpeting. That is the best of anything we have found, but it is not available in all sections. We can go to the sand-paper factory and get a paper that is good. The glue makes a sizing which prevents the grease from striking in. Tarred paper will serve a very fair purpose.

So much for preventing the caterpillars from climbing up. That is the way we were obliged to fight at that time. Now comes the question, How shall we fight them at the present day? With Paris green. But some of you say, We tried that last year. It was recommended, we gave them a heavy dose of Paris green, but they kept on eating. The secret of success is to begin spraying just as soon as the caterpillar hatches, and that is before the buds open. Go before the snow is off the ground, and you will find those little caterpillars living on the hope of what they expect to get later. Give them a dose then; one pound to a hundred gallons of water, and keep it up every week or ten days. There are sections you cannot reach; you cannot get your pump into your wagon, and you are obliged to fight them by hand, as we were, in some parts of our hillsides, among the rocks. There we fought by hand; we used suds made from strong soft soap, and then put on the band of lard and sulphur.

In most orchards, even if you are fighting with Paris green, I would recommend putting on the band, for the caterpillars are liable to leave their feeding ground in the neighboring forest and strip your trees after you have destroyed all of those in the orchard at first, as one of the best orchardists in the State knows to his sorrow. The caterpillars came in from a neighboring forest and cleaned off every tree. Whereas, if he had put the bands on he would have saved the whole.

EXPERIMENT STATIONS AND HORTICULTURE.

Prof. CHAS. D. WOODS, Director Maine Agricultural Experiment Station, Orono.

What I have to say this evening concerning Experiment Stations is little more than a compilation from State publications. I have drawn freely and without credit from the publications of the Experiment Stations and from the U. S. Department of Agriculture, to illustrate the lines of work the stations are pursuing in connection with horticulture. Before taking up such illustrations, a word explaining the origin of stations and their purpose is appropriate.

THE ORIGIN OF EXPERIMENT STATIONS.

Long ago an agricultural writer said: "Farming is the perpetual trying of experiments with soils, manures, and crops; with cattle and cattle food; with milk, butter, and cheese; with plows, harvesters, and harrows; with an almost endless list of things. The most successful farmers—those that get the most out of their land, their cattle, their crops, their fertilizers, their implements and their labor—are those who experiment themselves most industriously, most successfully and most intelligently, and who take the fullest advantage of the experiments of others. The best agriculture is that which, in old countries, on worn and intractable soils, has learned by long continued and varied experiments to make the gain of farming sure."

Once the farmer made the rude tools he needed for practice in his art; he now employs implements and machinery which can be made only with large capital and the highest mechanical skill and by men who make this manufacture a business. In like manner, the experiments which he can make do not meet his needs to-day. The research of finding out nature's secrets, the discovery of the laws which underlie the right practice of agriculture, is expensive of time and money. The more useful it is to be, the greater must be the outlay of money, labor and scientific skill. Within the past fifty years farmers and scientific men interested in farming have seen the advantage of using the resources of science to improve the practice of agriculture and have established Agricultural Experiment Stations.

Established for the benefit of agriculture, and hence of the community at large, the most of them connected with educational institutions, where experience shows their work is most successful, these stations seek to answer the questions which agricultural practice is asking as to the tillage of the soil; the nature and kind of manures; the culture of crops; the food and nutrition of domestic animals and man; the production of milk, butter and cheese; the diseases of plants and animals, and in general whatever the agriculturist needs to know and whatever experimental science can discover.

The Station makes experiments in the laboratory, greenhouses, garden, orchard, field, stable and dairy. It is probably safe to say that there are few subjects which the farmer has to deal with in the tillage of the soil, the use of manures, the cultivation of his crops, the care of his stock, the management of his dairy, and the preservation of his crop of stock from insect pest or disease, that are not being studied by some of the agricultural experiment stations.

Nearly fifty years ago a company of farmers joined themselves together near the little village of Moeckern, near the city, and under the influence, of the University of Liepsic, called a chemist to their aid and later, with help from the government, organized the first agricultural experiment station. Liebig in Germany, Boussingault in France, Laws and Gilbert in England and other great pioneers, had been blazing the path of progress for years before. A great deal of research bearing upon agriculture had been and is still being carried on in the schools and universities, but the action of these Saxon agriculturists in 1851, marks the beginning of the experiment station proper, the organization of scientific research with the aid of government as a necessary and permanent branch of agricultural business.

This experiment station speedily commended itself so that in Europe in 1856, there were five experiment stations; in 1861, 15; in 1866, 30; and to-day there are more than 100 experiment stations and kindred institutions in the different countries of Europe. In each of these, trained investigators are engaged in the discovery of the laws that underlie the practice of farming and in finding out how they are best applied.

So rapid and so sure has been the progress in this enterprise in both hemispheres, that private persons, educators, societies and governments have learned the usefulness and indeed the necessity of these institutions, not for the farmer alone, but for all who are dependent upon the products of the soil. The movement has extended so that there are to-day agricultural experiment stations on every continent, and in most of the civilized countries. There are experiment stations not only in Europe and North America, but in Asia, in Africa, in South America, and in Australia. It is impossible to form an estimate of the number of men that are engaged exclusively in this work of investigation, but there must be at least 3000 trained investigators studying in these agricultural experiment stations the various problems pertaining to the tillage of the soil, the care of crops, animal husbandry, horticulture and allied subjects.

The experiment station movement in Europe was nearly 25 years old before any experiment stations were established in this country. Storer, at the Bussey Institution, Johnson at the Sheffield Scientific School, and other pioneers in American scientific agriculture were laying the foundations. The demand for teachers in agriculture in land grant colleges stimulated education along these lines, but it was not until 1875 that any definite move was made toward the establishment of an experiment station. In that year, when the Connecticut legislature came together, Mr. Orange Judd, founder and then proprietor of the *American Agriculturist*, made a proposition to the Board of Agriculture, and through them to the legislature, that if the legislature would appropriate $2,800 for two years for an experiment station, he would personally give a like sum, and the Wesleyan University would place the services of their Professor of Chemistry and their laboratory at its disposal. The legislature accepted that offer, and thus the first experiment station in America began its work twenty-four years ago the first day of last month. This work justified itself to the agriculture of Connecticut, so when the next legislature met, in 1877, they made an annual appropriation of $7,000 for the continuation of the experiment station. The Connecticut Experiment Station thus begun in 1875, has continued, and is to-day one of the best, as well as the first in point of time, of experiment stations in the country. This station proved so successful that the example was speedily followed elsewhere. In 1880 four were in operation, and in 1887, there were some 17 of these experiment stations in 14 states. Our own station was established by action of the legislature of 1885. Its object, as stated in the law, being, "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."

In 1887, Mr. Hatch, member of Congress from Missouri, introduced a bill which has come to be known as the "Hatch Act," whereby $15,000 per annum was appropriated to each of the states and territories which have established agricultural colleges or agricultural departments of colleges for the establishment and maintenance of Experiment Stations. This act called into existence very many new stations, so that there are to-day in our country over 50 agricultural experiment stations. These 50 experiment stations now employ upwards of 500 trained men in the prosecution of experimental inquiry. The appropriations by the United States government for these experiment stations is about $750,000 per year. The several states appropriate enough, either directly or indirectly, to make the total sum about $1,000,000 from public funds for the support of agricultural experiment stations. This may seem like a large sum to expend annually for agricultural experiment stations, but it is less than 10 cents for each of the farm workers of the country, and less than 2½ cents for each of our population directly dependent upon agriculture for their support, and less than 1¼ cents for each of the entire number of people who consume the products of our farms. The Experiment Station costs about five dollars a year for each million of dollars invested in agriculture. We are spending not far from 30 cents for every thousand dollars worth of products on our farms in the attempt to increase the value of these products in future years.

THE PURPOSE OF THE EXPERIMENT STATIONS.

The purpose of the experiment stations as defined in the Hatch act are as follows:

"It shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural and artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States, as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective states or territories."

ILLUSTRATIONS OF THE WORK OF EXPERIMENT STATIONS.

The experiment stations have studied, or are studying practically all of the vegetables and fruits which are grown in this wide land. While nearly equal attention has been given to the plum, the pear, the apple, the raspberry, the blackberry, the strawberry, the currant and the gooseberry, I have, because of its importance in our own State, selected some of the lines of work being done in the culture, growth, and care of the apple to illustrate the work of the experiment stations along horticultural lines.

COVER CROPS FOR ORCHARDS.

An orchard cover crop is a crop grown in the fall and winter to protect the soil and trees of orchards, and at the same time to improve the soil. Unlike crops grown throughout the season, cover crops as a rule do not injure the trees by drying out the soil, for in many places heavy fall rains are the rule, and even where the weather during the fall is normally dry, the injury is less than in summer, since plants evaporate less from their leaves in the cooler weather and shorter days of fall than in the longer and hotter days of summer. Cover crops not only do not, as a rule, dry out the soil injuriously, but they also add directly to the moisture-holding capacity of the soil by the humus formed in their decay, and they hold much of the snow until it melts and is absorbed by the soil.

Another reason why cover crops are rarely as injurious as crops grown throughout the entire season, and are often beneficial, is that their growth is made after the trees have stopped growing and are maturing their wood for winter. The Michigan Station has shown that the majority of trees in that locality complete their growth by July. Of course the conditions observed in Michigan do not occur in all climates or seasons, but they show unmistakably the tendency of trees to make their greatest growth early in the season. Trees, therefore, require much less moisture in the latter part of the season than they do in the early part. Indeed, in moist localities it is often thought to be a distinct advantage to stop cultivation by midsummer and grow some secondary crop which will check the growth of the trees and cause them to mature before winter. The Washington Station, in studying the unusuallv severe freeze occurring in the fall of 1896, found that in most instances late summer cultivation had an injurious effect similar to late irrigation. "Wherever cultivation or irrigation had been kept up late in the season and the ground was moist and the trees in an active growing condition, there the frost did most damage."

Among other benefits to be derived from cover crops is the checking of washing and leaching of the soil. Light soils are often gullied by heavy rains in the fall, just as in summer, and some crop to bind such soils is beneficial. In the case of soil leaching and the consequent loss of plant food, especially nitrates, a crop is more valuable in the fall and early winter than earlier in the season, for in spring and summer the tree roots are in condition to take up much of the plant food as it becomes available; but from the time their leaves fall until the soil is frozen, the plant food which would otherwise escape in the drainage water, or be washed down beyond the reach of plants, can be saved only by secondary crops, which grow until stopped by the severe weather of winter. Even in cases where the leaching of soils is not excessive a deep-rooting cover crop brings up plant food from the subsoil and leaves it near the surface to be used later by the trees.

Besides preventing in part the loss of fertilizing elements from the soil, cover crops may serve as a direct fertilizer. For this purpose the well-known ability of leguminous plants to take nitrogen from the air and store it, so that it can be used later by other plants, is made use of. The use of such crops in ordinary farm rotations is well known. That they may be equally useful in case of orchard fruits is shown by tests at the New Jersey Station. Crimson clover was sown in the peach orchard on sandy soil in the latter part of July, and the crop was plowed under in the latter part of the following May. The cover crop retarded to growth of the trees somewhat in the spring, but after it was plowed under they gained rapidly, and both wood growth and fruitage were more satisfactory than in the remainder of the orchard, which was fertilized with nitrate of soda. The use of leguminous crops, however, is not to be recommended in all cases. It often happens that soils become too rich in nitrogenous fertilizers, and the trees, therefore, grow too vigorously, do not mature their wood well, and are unfruitful. In such cases leguminous crops should not be used.

Cover crops may also improve the physical condition of the soil. In this connection the relation of humus to the water-holding capacity of the soil has been already noted. Humus is also beneficial in changing the character of very heavy soils, making them more porous and lessening their tendency to puddle in wet weather. Cover crops which live through the winter are of use in drying out heavy wet soils in spring so as to allow cultivation.

Cover crops may also be advantageous in protecting the trees and fruit. The Delaware Station reports lessened injury to fruit blown from the tree where the soil was covered with a crop of crimson clover. In the extreme North, cover crops are thought to be of advantage in preventing deep freezing and alternate freezing and thawing of the soil and the consequent injury to the roots of trees. At the Delaware Station ground covered with crimson clover is reported as unfrozen when the temperature of the air was 14 degrees F. In some cases a cover may be injurious rather than beneficial to trees and fruit, through the protection afforded to insects, mice, etc.

To secure the best results with a cover crop that lives over winter, it should be plowed under early in the spring, while it is still succulent enough to decay rapidly. A crop plowed under late in the spring, after it has become more or less woody, will decay slowly, keep the soil too loose, and thereby serve to dry it out rather than retain its moisture. In many regions the crop may also do injury by the evaporation of moisture from its leaves if allowed to grow too late in spring.

[The speaker here mentioned in detail the work of numerous experiment stations, demonstrating the points enumerated.]

CULTIVATING VS. CROPPING ORCHARDS.

Whether orchards shall be cropped or given clean cultivation, how cultivation shall be done, whether it shall be continued throughout the season and similar problems, depend very largely on local conditions of soil, climate and the like. It is evident, therefore, that no definite rules can be given for the cultivation of orchards in all localities. The principles underlying successful culture, however, are the same everywhere, and therefore a knowledge of them will aid in deciding local questions.

Various experiment stations have conducted experiments to find out what methods give best results and why they do so. At the New York Cornell Station, it was found that the roots of trees only five or six years old have a greater spread than the tops. For instance, the roots of an apple tree in rich, cultivated soil extended eight feet from the trunk, while the entire top was not over eight feet across. Another apple tree in sod, with a top only six feet across, had roots ten feet long. A pear tree in poor soil had roots 21 feet long, while its entire top measured only seven feet across. The roots of an apple tree which had stood in sod since planting, were just beneath the surface of the soil, while the roots of those in cultivated soil were nowhere less than eight inches from the surface. These facts show that if orchards are to be cultivated at all they must be cultivated from the first, since otherwise the roots grow so near the surface as to be injured by plowing and cultivation. They also show that to get the full benefit of cultivation all the space between the trees must be cultivated.

At the Nebraska Station a study was made of the effect of cultivation on the growth of apple trees, the size of fruit and the water content of the soil. A small orchard was divided into three parts, one of which was cultivated regularly, and the other two left in grass and weeds, one of the latter being mowed and the other pastured by hogs. The report says: "Trees in cultivated ground suffered noticeably less from the drouth and hot winds of summer than those in sod ground. The foliage was darker and more vigorous in appearance, and there was no yellowing and dropping of the leaves nor wilting during hot windy days, both of which occurred with uncultivated trees. Apples from cultivated land averaged nearly 14 per cent. larger in weight than those from pasture land, and over 17 per cent. larger than those from mowed land." The average percentages of moisture in the first 20 inches of the soil in the different portions of the orchard in the latter part of October were: Mowed portion, 14; pasture portion, 14.7; portion cultivated until August 1, 17, and portion cultivated the entire season, 20.4. The next season the results were practically the same.

The California Station has recently reported an instance of the beneficial effect of cultivation on the growth and fruitfulness of orchards. Apricots grown in adjacent fields under exactly the same conditions, except for cultivation, showed great difference in behavior. The soil of the region in which the orchards are located has a rather loose texture. One orchard was cultivated several inches deep, and the other was uncultivated. During one season the trees in the cultivated field made a wood growth of over three feet, while those in the uncultivated field made a growth of not over three inches. There was also a great difference in the fruit. The average percentage of moisture in the first six feet of soil was 6.3 in the cultivated orchard and 4.2 in the other one. A recent bulletin of the Illinois Station reports marked benefit from clean cultivation of an orchard.

The injury caused by growing grass in young orchards is shown very emphatically by an experiment conducted at the Utah Station. Parts of an orchard were seeded to alfalfa, timothy, clover, and a mixture of timothy and clover soon after the trees were set, and other parts were cultivated, all being irrigated alike. Over half of the trees in the grass plats died and were re-set twice, while the cultivated trees lived and grew well. It is not to be expected that growing grass is young orchards is always as injurious as it proved to be at the Utah Station, yet the reported experiences of fruit growers and experimenters everywhere show the importance of carefully cultivating young orchards.

From the experiments referred to above it would appear that the growth of grass, weeds, and even such plants as field peas, through the entire season without cultivation, especially in young orchards, is to be regarded as an injurious practice.

Notwithstanding all this, it must not be inferred that clean cultivation is best in all cases. If the trees are set in fertile soil there is usually no injurious effect from growing a secondary crop between the rows while the trees are young and their roots do not occupy the entire soil, but the secondary crop should always be one that requires careful cultivation and does not evaporate moisture excessively, such as beans, peas, potatoes, cabbages, squashes, melons, and the like. The crops noted, and other similar ones, if not planted too close to the trees, do not hinder cultivation, and they evaporate comparatively little moisture. As an example of this, it has been shown at the Nebraska Station that in midsummer the moisture content of the soil of well-cultivated plats of cabbage, beans, peas, and potatoes, was but little less than that of cultivated fields in which no crop was growing. Such plants as squashes and melons may hinder cultivation late in the season, but that is usually not a disadvantage, as shown later. As the trees grow the crops should be planted farther from them until the tree roots occupy all the ground, when it is usually best to discontinue growing secondary crops. Orchards with trees set twenty feet apart should rarely be cropped more than three years, but apple orchards can often be cropped for seven or eight years. When the trees begin to bear it is usually time to stop cropping the orchards.

Aside from the growth of secondary crops in orchards, there are other cases where clean cultivation is not best. It often happens that in very rich soil or in very moist localities fruit trees grow vigorously, but do not fruit well. It is then necessary to do something to check the growth and induce fruitfulness. This may often be accomplished by seeding the orchard to grass. How long grass should be allowed to remain can be determined only by the growth, fruitfulness, and appearance of the trees. If the growth becomes very weak, and the leaves are light-colored, it is an indication that cultivation should be resumed. Indeed, it should have been resumed before these conditions appeared.

THINNING FRUIT.

Thinning the fruit of trees that have a tendency to overbear is recommended very generally and practiced very little. Few extended experiments in thinning fruits have been reported by the experiment stations, but where thinning has been followed systematically for a number of years in commercial orchards, it has been found profitable.

The number of fruits produced per tree may be regulated in two general ways: By pruning away a part of the branches to prevent the formation of too much fruit, or by picking off the superfluous fruits after they have formed. With such fruits as grapes, raspberries, blackberries, and the like, the former method is employed almost exclusively. An experiment reported from New York Cornell Station indicates that in the case of blackberries and raspberries, no means of regulating the number of berries per plant is necessary other than the annual pruning.

Among orchard fruits, perhaps none need thinning as much as Japanese plums, except, possibly, peaches, which, in commercial orchards, are thinned more systematically than most other fruits. It is reported that in favorable years the fruits of Japanese plums set so thick as to hide the limbs. In fact, the tendency to overbear is considered by some to be one of the greatest faults. Thinning the fruits of these plums has been favorably reported on by the Alabama College Station. The size of the fruit was increased noticeably by thinning.

The tendency to overbear is also seen in varieties of native plums, as is shown by an experiment with the Gale seedling plum at Wisconsin Station. About four-fifths of the fruit was removed from a portion of the tree, leaving the fruits about two inches apart on the branches. The fruits on this portion of the tree were considerably larger than on the unthinned portion.

The Massachusetts Hatch Station has reported the results of an experiment with apples and plums. A tree each of Gravenstein and Tetofsky apples was thinned on July 1, and a similar tree of each variety left unthinned as a check. In case of the Gravenstein, the yield on the thinned and unthinned trees, respectively, was, first quality fruit, 9 bushels and 2½ bushels; second quality fruit, 1 bushel and 2½ bushels; windfalls, 9½ bushels and 10½ bushels. In case of the Tetofsky the thinned tree gave one bushel of windfalls, and the unthinned tree 3 bushels; of second quality fruit the yield was one-half bushel from each tree; and of first quality fruit the thinned tree yielded 2 bushels and the unthinned tree none at all. Allowing 60 cents per bushel for firsts, and 25 cents per bushel for seconds, the market value of the thinned Gravenstein apples was over twice as much as that of the unthinned, and if the thinned Tetofsky apples, eleven times as much as that of the unthinned. It cost 48 cents to thin the Gravenstein and 35 cents to thin the Tetofsky. The net gain due to thinning was 85 cents for the Tetofsky and $1.85 for the Gravenstein. It is thought that the results would have been more pronounced if the thinning had been done two weeks earlier.

The results with plums were similar to those with apples, as regards the increased production of fruit.

The advantages claimed for thinning orchard fruits are about as follows: Thinning increases the size of fruit, gives it more color and a better flavor. It diminishes the amount of worthless fruit, windfalls, etc., increases the amount of No. 1 fruit, and in some cases increases the total yield. It lessens the amount of rot, especially in the case of peaches and plums, since the diseases can spread less easily where the fruits do not touch each other. Thinning also tends to keep injurious insects in check, as care is taken to remove the infested fruit.

[The speaker then called attention to the leading insect and fungous pests of the apple, and the work which has been done by the experiment stations in studying life histories and devising means of extermination. Among those mentioned were the apple curculio, the apple maggot, bud moth, tent caterpillar, borers, apple and pear blight, apple scab, apple rust and bitter rot and others.]

In the above I have attempted to outline some of the work which is being done by experiment stations in our country for the growers of the apple. If anything like a full list of the lines of work which are being taken up and the results which have thus far been obtained in apple culture were to be presented, I should have wearied your patience more than I already have. While in view of what there is to be learned, it would seem as though very little had been accomplished by the experiment stations, yet when one attempts to get together for a paper like this even a catalogue of what has been done along this one line, the amount is very great; and when it is remembered that important as is the apple, it represents only one of many fruits, and as important as pomology is, it is only part of the much larger subject of horticulture, the work thus far done is very satisfactory.

The work of the station goes on, ever increasing in amount and value, from year to year. Most of the agricultural experiment stations of the country were established in 1888. When another decade shall have passed, it is not a rash prediction to say that fourfold as much will have been accomplished as in the past decade.

WINTER MEETING.

NEW GLOUCESTER, JANUARY 18 AND 19, 1900.

A special meeting and exhibition was held as above, when the following papers and discussions were presented:

NATURE STUDY IN THE HOME.

MRS. V. P. DECOSTER, Buckfield.

To make a success of any business a person must like it, must have some inspiration and attraction for that business. Agriculture, more than any other calling, offers a broad field of study, and experiment. It would naturally seem that our country schools, where the scholars are surrounded on every hand with the best of material for study, should be the pioneers in Nature studies. Unfortunately, however, such is not the case. In our city schools you will find the children drawing from leaves, flowers and stuffed birds. They have cabinets filled with specimens for the study of Geology, Mineralogy, Entomology, Botany, etc., while in our country schools, where these specimens can most easily be obtained, they are seldom found, and but few teachers are capable of teaching them.

Until we have these studies taught in the rural schools, every father and mother should constitute themselves as teachers, even though they be learners themselves. The love of nature is not wholly a natural one, but is largely educational. When walking along a public street you may meet many strangers who will have no particular interest for you; but let a mutual friend introduce you to some of them, and then tell you about their homes, work, habits, characteristics and families, and the next time you meet any of them you will feel an immediate attraction. You will stop with a smile and a greeting and experience a feeling of pleasure. As your acquaintance progresses you will seek their homes, study them and their relatives, and if they are worthy, learn to love them. It is just the same with birds, plants and minerals. One may live among them all their lives, but without study or even a first introduction, will never love them. The commonest flower by the roadside is of interest when you know its name, family and habits.

A little toddling child will pick violets and buttercups by the roadside, pleased with their color and fragrance, but as he grows older this is not enough to hold his interest. The flowers soon become common weeds to him, unless he studies deeper. As I said before, introduce them; tell their names, families and peculiarities. Make them personal friends, visit them in their homes and invite them to yours. What a child learns under seven years of age, goes far to form his taste and inclination for a life occupation.

Of course we do not wish to make farmers of all of our boys. I believe in watching for a child's natural abilities in every direction, but Nature Study is a grand help in every path of life, and a person surely can never make a success of agriculture without Nature Study. Teach children to use their eyes and brains and seek for little peculiarities. Unless a child can see and think for himself, he will never remember much that is told him, but if the parent will tell him enough to create an interest, then he will watch and study alone.

But many parents may say—"How can I teach what I have never been taught, or taken an interest in myself?" Begin as a child, with the children. We parents are too old! We must renew our youth. We are too busy! We must take time to play. We stay indoors too much! Let us go down to the brook. Life is short! Let us get the best good out of it. "Except ye become as a little child ye shall in no wise enter the kingdom of heaven." Many ministers have given us many explanations of that text. I have found it to be a most delightful heaven to get to the brooks and woods with the children and be a child with them, close to nature's heart, for nature's heart is God's heart.

It is rather slow work to study in a haphazard way, without any particular aim or method, and much valuable time is lost. Even though there are many excellent books at a low price, upon such subjects, few parents know what is best to purchase, even if they have a desire and money with which to buy. They cannot leave their homes, work and families to attend an agricultural college; it takes all of their time and strength to earn a living, clothe their children and send them to school. They expect the schools to furnish the required knowledge. I was once talking of this very thing with an acquaintance who was a superintendent of a normal school, and I lamented the fact that we had no kindergarten schools in the country. He answered, "Your children, upon your farms, will get a better kindergarten training than any they could get in a city." I did not believe him. I had much work to do, like all busy mothers, and felt a little guilty to leave a floor unswept and dingy windows, to go into the woods with the children, but as they grew older and I saw how they remembered the names and habits of the birds and flowers and butterflies whenever I took time to go with them, I began to understand what that teacher meant. The knowledge they gained from living things out under God's blue sky, was worth far more to them than learning to use worsted, braid colored straws, and fashion paper boxes. But we have always been hampered for lack of reference books, and some aim or leader in study. Quite recently, however, I have learned of something which I believe is going to open up a most delightful and helpful course of study. It is a free course in Nature Study or any branch of agriculture, by correspondence, for both parents and children. This has been conducted for several years at the Cornell University Agricultural Experiment Station, Ithaca, N. Y., and a similar course has more recently been opened by the Experiment Station at Kingston, R. I. The directors advise what books are best to study for different branches, and members of the school can purchase them of the publishers at quite a discount from regular prices. The college also issues monthly or quarterly bulletins and lessons, while questions and directions are freely exchanged by mail.

Now for a few practical suggestions for mothers in teaching these Nature Studies at home. For germination, the best object lesson is to lay a thin layer of cotton batting upon a tumbler of water, place two or three beans upon the cotton and lay a little more cotton on it. The beans will soon swell and the process of germination can be plainly watched. By changing the water occasionally the vines will often grow two feet and blossom.

From now on is a good time to gather alder, maple, cherry, apple and willow buds and have the children watch them open. Don't mind if the sticks do look rather homely and clutter the house. Plan to have apple blossoms for Easter. Bear in mind, when forcing fruit buds, to procure branches at least ten inches long and break off the leaf buds and the smaller blossom buds, only leaving a few of the strongest buds on the terminal end. The whole plant will concentrate its strength upon those few buds. Pears, cherries and crab apples can be forced in from two to three weeks. Another good plan is to transplant in the fall several plants of the early spring flowers into a box and keep it in some cold place till the latter part of winter and then bring them into the house for forcing.

In studying flowers with children, a very valuable book is Mrs. Wm. Starr Dana's "How to Know the Wild Flowers." This is full of good illustrations of many of our wild flowers, so arranged that any child who can read, can easily find the picture and description.

In studying seed formation and plant germination a mother has the most beautiful object lessons by which she can teach children sex and reproduction in both the plant and animal kingdom, in such a way that they will see God's laws working the same through all nature, and the things which seem a vulgar mystery to the ignorant child, will be to them a simple, pure, and natural law.

I believe a child can gain a broader education while playing about a little country brook, than from any one educational book ever published. The six inch brook trout will look larger to the boy of ten, than the six pound Rangeley lake trout to the man of forty. The rushes, mosses, and ferns that line the banks of the brook will look richer and more luxuriant than any tropical growth of Porto Rico or the Philippines which he may visit in after life.

The gentle ripple and splash of the water over a stony bed in summer, or the rush and roar of the swollen stream in spring, will recall fond memories as long as life may last. But with all these things, his enjoyment will be keener, purer, and more lasting, if there is a guiding mind or teacher to answer his questions, to call his attention to laws governing these things, and if he has books for reference.

When you were boys, you found in the bed of the brook, a peculiar little worm encased in a roll of bits of bark, sticks and sand stuck together. It made fairly good fish bait, if you had no angleworms, but did you know what it was; or how it came there; or that it would soon change into a dainty Caddice fly? Did any one ever call your attention to some ugly looking black bug crawling about among the rushes of sluggish water? And would you ever have thought of watching on till he crawled up some stem into the sunshine, where his skin split open and out came a brilliant dragon fly, with great gauzy wings; or did you simply call it a "devil's darning-needle" and run away for fear it would sew up your mouth? You probably found the wonderful leaves of the pitcher plant in the meadows; but did you study it closely enough to learn that what appeared to be a generous offer of drink to thirsty insects, was in reality a most wonderfully contrived deadly trap, for a carniverous plant; and that the beautiful leaf of the sundew was a similar trap for the insects?

When you played on the ledge in the pasture, if you noticed the scratches and grooves on its surface, did any one tell you of the great ice mountains that swept over this country ages ago, and left those scratches? And when your father scolded about the rocks on his farm, did he lay it to those same glaciers leaving the boulders there; and making the soil what it is? And when you lifted your heel to crush many an ugly worm, did you know you were killing beautiful butterflies as well as injurious moths?

The other day I called upon a friend on the top of Goff's hill in Auburn. As I was coming away, I noticed upon a branch of a cherry tree close by the piazza a brown bunch about three inches long and perhaps an inch and a quarter in diameter. "Oh!" I cried, "Here is a Cecropia chrysalis, do you care for it? May I have it?" "Certainly you may have it," my friend replied, "I noticed that there the other day, and said that there was something growing on that tree, and I must burn it up. I don't know what it is." And so she broke off the small branch and I carried it in my hand all the way home, so delighted with my treasure, that I had nearly reached Buckfield before I remembered that I had left my purse at her house. Now she had a bright little girl that would enjoy the beauties of that wonderful moth which is sleeping inside that brown cocoon as well as my children, if she were only taught.

Four or five years ago, when I began the study of entomology with my children, I did not know the name of a single caterpillar or butterfly, but the last two years have been exceptionally good ones for studying a few kinds of caterpillars. Nearly every one has such a dislike to caterpillars that this would not, at first, seem a very interesting study, but we have found it extremely so. It is surprising how many kinds there are, as soon as one begins to watch them. Not only my children, but the men of the family, and even the neighbors, when they find a peculiar caterpillar bring it to me. These can be easily watched in the house by placing them under a screen or glass, or in a glass jar. We often have several varieties under wire fly screens. Each caterpillar has its own particular variety of food on which it feeds, so it is necessary to notice upon what plant it is found feeding, and keep it supplied with fresh leaves of its kind until it enters the pupa state. When they are ready for this change they stop eating and anxiously crawl about their cage as if searching for something. For those varieties which enter the ground for their transformation, a box of earth should be provided. Other varieties roll themselves inside of leaves, or spin a cocoon in some corner. Still others, like the Asterias, Antiopa, Atlanta, and Archippus, suspend themselves from some object.

I have already taken so much time that I will not begin upon flowers, minerals and birds, which are equally interesting if not more so. If you once begin the study of any of these branches, you will be surprised to see how interested you will soon become and how the knowledge seems to be lying all about you, only waiting to be appropriated.

If you begin with minerals, your friends will learn of it, and give you specimens. Neighbors will tell you of something interesting upon their farms. You cannot take a walk, or go near a ledge or stone wall, without seeing something interesting.

If you begin the study of birds, there will be the same attraction. You will see new birds, hear new notes, and find nests which you never saw before, although there have been the same about you for years. There seems to be a law of mind attraction which calls to us those things with which our mind is filled; or rather, which opens a sight which has been lying dormant.

I do not see how any one can be a true lover of nature without being a Christian! Will you just peep into a church I know, for a moment? Come up through the pasture to the top of the hill where the great pines grow. Let us go in by this old wood road. Bare your head as you come down the aisle. All of these great pines stand here silently, worshiping. Under your feet is a beautiful carpet of pine needles, traced with arabesques of trailing evergreen, a hidden choir of birds is praising God with sweetest song. The soughing of the winds in the tree tops rolls over you in mighty waves like the tones of some great organ in a vast cathedral. But the sermon comes straight from God. You must still your ears and very thoughts, and the Spirit within you will whisper thoughts no man could ever say. You will feel your very soul grow stronger and know that you are in the presence of the Infinite.

THE APPLE IN COOKERY.

Miss Anna Barrows, Boston.

(Abstract.)

[Abstracts of other lectures by Miss Barrows are to be found in the reports of this society for 1892, 1893, 1894 and 1895.]

A few years ago some explanation seemed necessary when a lecture on cookery or domestic science was added to the program of any agricultural meeting. Now, this is a common occurrence, and in farmers' institutes all over the country questions pertaining to the home life, and to the consumption as well as the production of foods, are generally discussed.

Surely it is desirable that the consumer should be educated to discern the finer points in the quality and flavor of different food products. If the producers also would more carefully study this phase of the question, ultimately they would have larger demands for their crops. Many varieties of fruits and vegetables are raised merely because they are showy, and will bear rough handling in transportation, and little regard is paid to their quality and flavor for the table. The prevalence of such articles in our markets naturally prejudice buyers against this class of foods as a whole.

There is much yet to be learned about the adaptation of different varieties of apples to the different processes of the kitchen. Some apples are best suited for baking, others for certain kinds of pudding, and still others for sauce and pies. But to the average consumer, an apple is an apple and the quality and flavor of apples for cooking are rarely considered. "Cooking" apples like "cooking" butter are wholly undesirable; we better use less and let that little be of good quality.

The quality of eating apples on sale in our railroad stations, restaurants, and fruit stands is not above reproach, and fruit growers should make it their business to buy samples from such stands and demand that better varieties be offered the public. As a rule good apples are less common and full more expensive than the oranges and bananas, which are offered the travelling public. This state of things, of course, is not favorable to the apple grower.

Before proceeding to the cookery of any food product, we do well to study its chemical composition and from that we may learn how to combine it with other food substances. The analysis of the apple given by Professors Atwater and Woods in bulletin No. 28, of the U. S. Dept. of Agriculture, Office of Experiment Stations, published in 1896, gives the composition of the average apples as purchased, from ten different analyses as follows:

Refuse	25
Water	61.5
Protein	.4
Fat	.4
Carbohydrates	12.4
Ash	.3

The edible portion of the apple, in an average of ten analyses, was as follows:

Water	82
Protein	.5
Fat	.5
Carbohydrates	16.6
Ash	.4

At first it might seem that any substance containing so much water had little food value, but it must be remembered that the human body is at least two-thirds water and therefore our foods should be mainly water. When we notice the minute quantities of protein and fat present in the apple, we readily understand why we so often combine cream and custards with apples in puddings. Moreover, the carbohydrate portion being mainly sugar, it is also reasonable to use apples with starchy materials as is done in rice and tapioca pudding, apple dumplings, etc. Doubtless the chief dietetic value of the apple lies in the variety which it enables us to give to the cereal products which, of necessity, must be the main part of our diet, and to the valuable mineral salts and acids which it contains. There are many old proverbs to the effect that "It will beggar a doctor to live where orchards thrive." When we know more about the cookery of apples, and kindred fruits, and use them more largely in our daily diet, perhaps the patent medicine venders will not reap as generous harvests as they now do. Many barns and fences, as well as the country papers, throughout New England, bear witness that manufacturers of patent medicines find it profitable to advertise their wares in country communities.

More should be done to preserve the abundant apple crop of one season for the next when the supply will be scanty. Jelly making should not be left to the city manufacturer wholly. Too often the dried skins and cores of apples from the country canning factory are boiled out in the city establishment, and by the addition of artificial colors and flavors this substance is put upon the market as currant, quince and every other known variety of jelly. Might not an honest apple jelly be made where the apples grow at a fraction of the cost of these shams?

For many puddings it is desirable to stew the apples without removing skins and cores unless these portions are imperfect. The seed gives an agreeable flavor and the skin imparts a bright color. When thoroughly cooked all the soft pulp can be rubbed through a strainer and used in a variety of ways. It may be combined with gelatine or custard or whipped cream in very elaborate desserts, or simply mixed with any cereal. Such pulp is sometimes put into bread or muffins.

A most attractive way to prepare apples with bright colored, tender skins is to core them, without paring, and cook slowly in a syrup made of equal parts of sugar and water until they are perfectly tender, but not broken. The spaces where the cores were, may then be filled with jelly or a mixture of chopped nuts. Or each apple may be placed on a round slice of sponge cake and the whole garnished with thick whipped cream.

Baked and fried apples should be served with fat meats more frequently than is commonly done. In this case an omelet will be garnished with rings of fried apple.

A quick dessert is a variation of the old time apple duff or apple dumplings. The apples should be stewed in a thin syrup until they are tender, then dumplings made as for a meat stew are dropped all over the surface of the hot stewed fruit. The saucepan is then closely covered and allowed to cook rapidly for ten minutes, then serve dumplings and fruit together with cream and sugar. This dish is a good illustration of the way in which we manage to combine the food substances needed in a daily diet. Mineral matter in minute quantities is found in all. Water is present also in greater or less degree; the flour from which the dumplings is made furnishes starch and some protein, while the cream gives us more protein and considerable fat. Where such a dish is served after a meat dinner no more protein would be necessary, but the quantity could be increased by adding beaten egg to the dumpling.

[While speaking, Miss Barrows indicated in a practical way the method of preparing the various dishes mentioned and at the close of the lecture those who chose to do so were given an opportunity to sample the productions.]

CURRANTS AND GOOSEBERRIES.

R. H. Libbey, Newport.

(Abstract.)

Profitable small fruit growing must ever remain in the hands of those who love the work. There are intuitive faculties and perceptions, as well as enthusiasm and study, necessary for success, and only a small per cent have that appreciation, or are willing to give that study, which alone will sustain effort year after year.

Much also depends on the variety grown, for the best are none too good. For gooseberries, I prefer the Downing for a market berry; they are large, attractive, and prolific bearers, but would recommend the setting of a few Industry and Smith's Improved. The Red Jacket is highly recommended, but with me, thus far, has not been a success. For profit, the gooseberry is as good a berry as I know of, the bushes have been known to bear for twenty years and yield a good crop when properly trimmed and cared for, and the fruit always finds a ready market. In 1894, I set one hundred and fifty bushes and in 1895 they bore one quart to the bush. In 1896 they bore five quarts to the bush, in 1897 ten quarts to the bush. I have picked seventeen quarts from one bush.

The currant comes along partly with the raspberry and follows it for weeks; indeed none of the small fruits will remain so long upon the bushes without injury as will the currant, and since the introduction of the newer varieties, and the easy way of destroying the currant worm, this fruit is attracting more attention than ever before. If remuneration is the object with fruit growers, they certainly can find it in the currant and gooseberry.

From recent minutes of the horticultural society, it appears that Dr. Cannon of Geneva, from 1-16 of an acre, sold 15 bushels of currants, besides what was used in his own family, and his crop was estimated at 250 bushels to the acre, but an average of 150 to 200 bushels is an excellent yield. It is evident, therefore that if properly cultivated, large profits are sure. In naming varieties, I should place Fay's Prolific at the head of the reds, and Lee's Prolific at the head of the blacks. The currant and gooseberry require about the same cultivation, are infested with the same insect enemies and require the same kind of treatment to destroy them. I use as a preventive, London purple or Paris green, applied before the fruit sets. If you begin its use as soon as the leaves become visible, there is not much danger of the worms injuring your bushes. Should you discover worms later, white hellebore in the proportion of ¼ pound to 16 gallons of water, applied with a spray pump, will check the ravages. After my berries are picked, I spray again to prevent the worms from working on the foliage.

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While the growing of currants and gooseberries calls for care, skill, application and a study of the habits of the bushes, for clean cultivation, good mulching and fertilizing, no man can succeed who does not appreciate the importance of marketing in the right manner and at the right time. Never sell immature fruit. You simply destroy the taste and desire for a good article. The demand for gooseberries has been seriously checked by the attempt to force immature, undersized and necessarily bitter berries on the market. Mature your fruit by the best of attention, ship only perfect berries of full size, give full measure, and your customers will come again and again. This is the way to make the growing of currants and gooseberries profitable and yearly increase the demand for this luscious fruit.

RASPBERRIES AND BLACKBERRIES.

E. P. CHURCHILL, Hallowell.

(Abstract.)

Raspberries and blackberries will live in almost any place in reasonably dry soil, though the raspberry does well in its wild state in very damp soil.

Land suitable for corn has long been a standard guide to grow the two species but it seems to me one very important point has been overlooked; where dressing is broadcasted we may expect many sucker plants, remote from the hill or row. Now we can overcome this very much by furrowing deeply and using the dressing in these furrows as the plant will readily find its food.

Manure applied in the row will produce more fruit, and stronger plants, with far less work, with much less dressing, and I will say, less weeds and grass, than if applied broadcast.

It is the general practice to let the old growth remain until the next spring, or at least many do, but I prefer to cut out the old canes just as soon as possible after fruiting, for several reasons. The new plants will become more stocky, will ripen up far better and the rows need hoeing and working; the latter should be done without delay. I want to say here, one of the best tools to cut out canes with is a narrow spade; have it sharp; take a scythe-stone along and keep it to a keen edge. One can cut the canes close down.

Until recently I have left my plants standing through the winter, but the last two seasons have laid them all down, not by burying the tops (except the black raspberries), but by looping them together, bringing one top in by the lower part of another, and so on, making binders thereby for others. Many small plants can be held down, being under larger ones. I find it pays even to tie many with strings. With a season like the last I much prefer getting them down early, as there was a late growth caused by rains after the drouth, and plants laid down will ripen the wood sooner than if left standing.

In spring the plants should not be straightened up at once, but after a few days they will come up very much and will bear assistance. Then about one-third the top should be cut off, care being taken not to work deep near rows, after the first season.

Fertilizers should be applied early in spring, even before plants are straightened up, and it seems to me ashes are excellent. A little salt or fine bone, especially on dry soil, is good. All the above applies to both raspberries and blackberries.

I have until the two last seasons cut the black raspberries off when, say, two feet high, before fruit season, but I have made an improvement in allowing them to grow, and as soon as fruit is off, cut out old wood, swing the stool plants round all one way and tie to each other, then cultivate in the spaces thus made, and in September bend the plants down close, and a whole hill together and cover a foot or more of tips. In spring I raise them up about four feet and, if in hills, bring the tops of two together, forming an arch, then an open space. I find I get more fruit and the bushes do not feel the winds nor are they in the way so much as in the old way, and above all they winter far better. It would seem, bound thus, as though there would not be room, but the laterals will come out in a wonderful manner and rejoice one's heart with plenty of the largest fruit.

All of the tip-rooting sorts are sure to do better if set in a depression not covered full depth at first, unless old plants, for a young plant is easily smothered if covered as we do the red sorts.

VARIETIES.

The Turner I have fruited for several years, but have discarded. The berry was too small and too soft, though the canes were free from thorns (a good feature) and among the hardiest.

The old standard, the Cuthburt, I still grow, it being productive, of good size, etc., yet not as hardy as the Turner. By proper laying down and fertilizing, however, it will please all.

I have increased the Loudon as fast as possible. I find it a fine sort in all respects. In bush it resembles the Turner, smooth and clean and very stocky; fruit large and abundant even on small plants. In the future I shall plant only this sort for reds, unless it be the Marlboro, which I find an excellent very early sort.

I have a few of the All Seasons, which is, as a whole, a fine thing. It will give us fruit as a surprise, large, red, and of fine flavor; plant short and stocky, of peculiar color, very hardy.

I planted a few of the Royal Church, which I have discarded as almost worthless. It resembles the old Clark, crumbly, and has not many good qualities, anyway.

The Columbian, (a cross between red and black) I find a remarkable fruit, more prolific than the Shaffer, and the berry is firmer, not quite as dark in color, and good enough to induce one to bestow extra care on the plants, as they are not perfectly hardy, but if allowed to grow uncut and laid down close, they will astonish the grower.

The good old blackcap, Gregg, is a favorite sort with me, very large and firm and as productive as one could desire, good enough raw or canned, cooked or dried; plants not perfectly hardy, yet with care and proper treatment will give good satisfaction.

BLACKBERRIES.

Years ago, I grew the Snyder to quite an extent, but the berry was small and the canes were so apt to break off at the crown and were so uncomfortable on account of thorns, I discarded it. Something better I find in the Agawam and the Wachusett thornless, so-called, both excellent in every respect.

I want to caution all as to the extolled Oregon Evergreen blackberry. I have worked three years on one plant and have to say, let it alone. Of all the thorny things it is ahead; regular hooks clear out on the leaf stems and the fruit is small and late, while plant is tender. It killed in spring after I removed the covering. My experience and 50 cents for one plant say let it alone.

The raspberry-strawberry is of no use, at least four years' experience has not proved it of any value whatever.

Something new: I wish to call the attention of the society to something peculiar. For a few years I have found many raspberry roots with enlargements, some as large as an egg, often two or three on one plant. The old plantations taken up were worse than plants of more recent setting. I am not able to tell whether it is a fungus or what, nor do I know as it was a detriment to the plant. Nothing of the sort has ever come to my notice before.

[Mr. Churchill's raspberries are evidently troubled with the root gall (*Rhodytes radicum*)and all affected plants should at once be removed and burned.—W. M. M.]

STRAWBERRIES.

E. W. WOOSTER, Hancock.

DOES CLIMATE AFFECT TIME OF MATURITY?

Under the above heading I saw an article in the American Gardening, on page 848, December 16, 1899, written by C. W. Benson of Alvin, Texas; I here quote from it:

"I have noticed that plants shipped in here from the North commence to fruit two or three weeks earlier than the same variety, which has been grown on our grounds for three or four years. Conversely, it may be possible that our plants, among the late varieties, may be as much later when transplanted to the North, and that this characteristic is retained for at least two years.

"It is probable, therefore, that the picking season in a great many localities might be nearly doubled, by shipping in early plants from a more northern latitude, and late sorts from the South every two or three years, or until they have become acclimatized."

Now there is not the least doubt that Mr. Benson is on the right track of a "happy hit," at least, as far as the Southern fruit grower is concerned; for every farmer should know that that class of vegetable life which has the ability to adapt itself to climatic conditions is greatly affected by season's influences in hastening or retarding the time of maturity, and that this influence will last for two or more years.

Take, for instance, our Indian corn; every enterprising market gardener of the South knows the value of northern grown seed of early varieties over his home-grown stock. Where can you find a vegetable life with greater powers of adaptability than the strawberry? There is not a state or territory in the Union where the strawberry cannot be successfully grown. While this is true, it is not saying but what it will flourish better in some than in others. It will flourish best where its requirements are most closely met. That stands to reason. We can not compete with the southwest central states in the production of corn, except, perhaps, in these western counties with sweet corn for canning, because climatic as well as other influences are more favorable for the production of this vegetable in those states. Corn requires hotter weather than the greater part of Maine can give to do its best. From 90 to 100 degrees is all right for corn, but it is 20 degrees above the requirement of the strawberry.

The strawberry, as far as the growth of the plant is concerned, if furnished plenty of water, will flourish well in the South; but where perpetual summer reigns it will not fruit well unless the growth is checked in some unnatural way.

The strawberry must pass into, at least, a partial state of dormancy before it can mature fruit-buds. The most natural way is by a low temperature, the least natural way is by drouth. In the far South the latter must be the way. In certain sections of the North, the most natural, and thus the most healthful way can be found.

The strawberry is a cold-blooded plant, and will grow at a very low temperature, in fact, at all times when the ground is not frozen, even though covered with several feet of snow. But the growth of the plant at this time is almost wholly confined to the roots and crowns, augmenting the fruit-producing powers of the plant.

This winter growth is much dependent upon the presence of green and healthy foliage, and unless this is preserved intact by proper covering, as freezing weather approaches, very little improvement can be seen.

When the foliage has been removed from the plant by any cause which has not destroyed the roots and crown, its first efforts are all along the way to repair the damage that has been done, because the production of fruit is impossible without foliage. If you mow off, or burn over, a strawberry patch without injury to the crowns, you will never see a sign of a fruit-bud till after they have regained a strong foliage; but let a drouth attack a patch in full foliage, fruit-buds will at once begin to form, and if the season is long enough, the result will be a second crop of fruit.

One should easily see from this how our northern grown plants, when set in the South, produce earlier fruit than the same variety that has been acclimatized to the conditions of that climate. First, because our plants are stronger, being developed under more favorable conditions as far as the summer influences are concerned; second, by greater fruiting tendencies, being developed by a longer period of partial dormancy; third, because more susceptible to the influence of heat.

VARIETIES AND IMPROVEMENT.

Varieties of strawberries, like all other fruits, regardless of favorable seasons, will have their off years in fruiting; and I have noticed that on the off years of the usually productive varieties, those varieties that have been only moderately productive most seasons then make their best showing. Before we had so many good staminate sorts, some five years back, I planted more largely of the pistillates; for a time all went well, but when there came two wet seasons, just at the blossoming period, matters did not go so well. With so many good staminates of all seasons as we now have, I do not take chances by planting largely of the pistillates. The pistillates are never as reliable on a wet season as the staminates.

All varieties, no matter how carefully propagated, will in time run out. All perfect life, combining sex, produces seed. This seed was produced for the purpose of perpetuating its species. No new life can be produced except from seed. All other methods of propagation are auxiliaries to enlarge or multiply life.

Now I come to the befogging question: Can we properly apply "pedigree" to plants propagated by runners without greatly muddling matters? The definition of "pedigree," as I find it, is: "Line of ancestors." Now is there any line of ancestors formed by this method of propagation?

Let us see. Runners which are thrown out from plants, after they get to a certain length, form new plants, but remain attached to the main plant till they have become well rooted.

If these runners are detached as soon as formed, the plants will be formed on the stool of the old plant and remain parts of that plant. They are just as much parts of that plant, in reality, if allowed to grow and root in their own way.

It stands to reason if there is any difference in the fruiting powers, formation, color, quality or size of the fruit of these several plants thus formed, save from the advantage given by earlier rooting, it must be of a local nature and thus can have only a local effect or influence. Every one of these plants of equal age was designed by Nature to be of equal value for propagation purposes.

Now we come to the most vital question: Can we improve our fruit stock by selection further than to select for health and strength, except through seed? Here is my answer to this question: Imagine that I hold here between my thumb and finger the tiny seed of a strawberry, incased in a hard shell, which is more easily ruptured after it has been frozen—clearly showing from the very start the climate best suited for its development. Within that tiny case, sealed up, in the embryo, is a strawberry plant and its fruit, but in the plant and its fruit must be a consideration for the future. Within that little case, so to speak, are all the plans, drawn by that greatest of all Architects, and all the tools necessary to build and model the future plant and its fruit; the mixing pots for the coloring, the brushes and all paraphernalia, is all, all there; and when the work goes on, it must at all times be under the watchful eye of that great Architect. Is there any reason for us to doubt that if all proper material is furnished and conditions favorable, the highest degree of perfection possible will be the result? Is it within man to improve upon the plans and labors of Nature? Man was made to serve Nature, not to be her master; her pupil, not her instructor.

But Nature is a very indulgent mistress. She understands well the caprice of man, and seeks to satisfy it in every reasonable way. She will allow man to assist her in many ways, but she will not allow him to dictate to her how she shall do her work, how much she shall do, or how long she shall be in doing it.

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These are complicated questions; they are no less important questions, for upon their correct solution and correct following hinges much of the success of fruit growing. It is very necessary that we should understand them and understand them correctly, that we may follow the correct methods of fruit improvement.

While these questions may seem complicated, as we undertake to solve them by considering only one special group of life, much of the difficulty is removed when we consider them in connection with all life; and that life governed by one collective law. As we can better understand the workings of the laws which govern those lives of a higher order, we have only to apply the same to those of a lower, in order that we may better understand them also; and as we more closely study these universal laws of life, we not only grow wiser in that wisdom that better fits us to perform the duties in the business department of our lives, but infinitely wiser in that wisdom which more fully comprehends that the world is truly His and that He made it.

Please imagine again for just a moment that I am holding that tiny strawberry seed. Within it, in a dormant state, are the combined qualities, in the abstract, of two opposite natures, in sex. The combination of qualities makes the individuality in the life that is to be. There never has been, there never will be again, another combination exactly like it. Nature never repeats. Although the parentage of this little seed may be unknown, when the plant is developed, from its characteristics, an expert can quite easily tell to what family it belongs.

The value of a seedling plant over its parents depends upon the desirable combinations of their best qualities. This combination of desirable qualities is very rare, however, and there is not one chance in 400 of a seedling's being better than its parents.

While these seedlings are developing it is very necessary that they be cultivated in a way to strengthen, and thus enhance their valuable qualities. Many valuable seedlings are ruined from the very start by wrong culture. This work should be intrusted to none but experts.

DISCUSSION.

J. W. TRUE: Please name varieties to cover the whole season.

MR. WOOSTER: Some of the best early varieties are: Hawaii, which I have sent out through New England and the West for the growers to test, and they have reported very favorably. The Puerto Rico is another very early variety which ought to be in everyone's collection, and is very early. It has been tested for four years, and is also very satisfactory. It is a very uniform, symmetrical and beautiful berry. It has fine flavor and is excellent in quality. Do not plant on clayey soil, but on high ground, give plenty of room and high cultivation. The Clyde has been badly propagated and is inclined to rot. Give it dry soil and plenty of room, and it will give very good returns. The Glen Mary and Bubach are also good varieties. The Nick Ohmer is a good grower and healthy, but not very productive and so not profitable. The Parker Earle is a very late variety and a good one. The Hunn is extremely late and inclined to rust, but I have carefully selected my plants, set them in new soil, carefully propagated them and got rid of the rust. They give about a picking every other day.

ONE RELATION OF INSECTS TO PLANTS.

A. H. Kirkland, M. S., Malden, Mass.

(Abstract.)

The practice of division of labor among human beings is as old as civilization. In fact, in these later days, it is generally considered that the degree of division and specialization of labor is a standard by which the social development of a community may be determined. In the average community each worker performs one or more kinds of labor, contributes one or more kinds of product and consumes a part of the products of other workers. To facilitate these various operations curious tools and elaborate mechanisms have been devised. Here human ingenuity, taxed to the limit, has yielded its most excellent product.

The division of labor among insects and plants dates back to a period whose history has never been written, and whose chronology we can only surmise. A single phase of the inter-relations of insects and plants, that of the fertilization of flowers, furnishes a most delightful field for study and one which may be investigated with profit by every lover of the outdoor world. Here we find the mysteries of flower and seed production disclosed; here we learn of the most important service of the honey-maker, and here we see mechanisms and adaptations between plant host and insect guest a thousand times more marvellous and exact than the best product of human brains directing human hands.

Underlying all the interesting phenomena of this entrancing field of research is the great fundamental principle of reproduction of species, the chief end of life. All other activities and stages of development are subsidiary or contributory to the attainment of this grand result. The hidden seed germinates, the roots develop, the leaves unfold, the stalk rises and the plant grows into the form and beauty of its parents. These are natural stages of development, mainly dependent upon ample food supply and proper climatic conditions. Granted suitable soil, proper warmth and adequate water supply, nearly all our cultivated plants can go thus far alone. With the approach of maturity, their productive function develops, and buds and blossoms appear. Now the energy of the plant, working independently in this direction, is not sufficient, for the time has reached its limit. It must now seek and receive the assistance of insect visitors, and divide its labors with the members of the winged world before the crowning work of seed production can begin.

And now for a moment let us glance at the structure of a typical flower in order that we may better appreciate the plant's great need of external assistance and the important role of insects in plant economy. We find such a flower made up of four distinct sets of organs, the two outer sets, the sepals and petals, serving to guard and protect the inner essential organs and as guide-boards on which are displayed directions for the insect visitors. The slender stamens bear the pollen with which the flowers are fertilized. The pistil receives the pollen grains and conducts their vivifying contents into the seed-producing region at its base. This is a brief summary of our knowledge of the functions of the flower organs. The essential facts are now commonly understood, even by school children, but by what slow and difficult stages have they been determined! Early students of flowers held that the pollen, as well as the nectar, was in the nature of an excretion, an undesirable product from which the flower must free itself.

In 1682 Nehemias Grew astounded the savants of that day by the announcement of the fact, well substantiated by examples, that the pollen was the means of insuring the fertilization of the flower, and that unless it reached the stigma, no seed could be produced. In the general controversy that followed the announcement of Grew's discovery, much valuable energy was wasted in argument, and not until some fifty years later did the fact became firmly established and generally accepted. The work of Linnæus at this time, covering a large number of investigations, removed all doubt as to the function of pollen. But even the great Linnæus, "father of natural history," though he was, seems to have been in error as to the method by which fertilization took place. He appears to have believed that the stamens grew up over the pistil, and at the right moment discharged their golden load upon the waiting stigma—all of which was ingenious, but not altogether correct.

Late in the 18th century, Christian Conrad Sprengel, a German scientist, given as much to reflection as to observation, found that there were hundreds of cases to which the Linnæan hypothesis would not apply. In many flowers where the stamens and pistils matured at the same time, the two sets of organs were separated by notable intervals of space across which the pollen could not pass unassisted. After long study he announced his startling discovery that flowers are fertilized by insects, that insects in seeking the nectar, brush off the pollen and convey it to the stigma. While this author was thus the first to call attention to the role of insects in fertilizing flowers, yet other students were quick to note its importance and to find that there were many problems in plant fertilization to which Sprengel's explanation could not be satisfactorily applied. In some blossoms the anthers ripened and discharged pollen days before the pistils matured. In others the pistils were fully developed and the stigmas wide open days in advance of the maturity of the anthers. These obvious difficulties were sufficient to prevent the general adoption of Sprengel's ideas, and his work became forgotten in the 70 years that elapsed before the era of Darwin's labors in this field. The master-mind of Charles Darwin at once grasped the contradictory conditions which had seemed to refute Sprengel's theory, and drawing as it were a *bee line* between the flower with mature stamens and the one with mature pistils, he cleared up the mystery and enunciated that great law, "Nature abhors perpetual self-fertilization." Farther than that, he showed that flowers generally were adapted to secure cross-fertilization by aid of insects either through a difference in the time of ripening of the essential organs, or through the development of special structures.

For this work of cross-fertilization, nature has provided the most wondrous mechanisms, many of which we may study and admire with a minimum amount of effort. They may be found in every orchard; they may be studied in every pasture; every woodland exhibits them; and each garden spot numbers them by the score. Their novelty attracts, instructs and delights, and the more they are studied, the greater becomes our admiration and the stronger the spell of their witchery over our senses.

To appeal to the varying fancies of insects, the delights of color, odor or flavor are most lavishly offered. Housewives know the force of the aphorism, "the way to a man's heart is through his stomach," and the same rule governs the wooing of the flowers. Nectar, the chief ingredient from which honey is made, is the principal offering of the flower to its winged suitors, but this liquid sweetness is usually presented in such a manner as to cause the insect to participate unintentionally in the consummation of the flower's existence.

And here it may be well to emphasize the great value of the honey bee as an agent in cross-fertilizing flowers. Probably no insect seeks nectar with more avidity or greater zeal, and none is more useful to man. Bee-keeping does not receive the attention it deserves among our farmers and gardeners. A hive of bees is just as necessary on the general farm and will yield as good returns in proportion to the investment, as a span of horses or a good milch cow. Herman Müller, who, next to Darwin, has done as much as any single writer to familiarize us with the services of insects in fertilizing flowers, has recorded that of 1,000 insect visitors to flowers there were bees, 413; flies, 305; beetles, 89; butterflies and moths, 69, the remainder being divided among the other order of insects. The importance of bees in this work of cross-fertilization leads me to mention a modern danger to the apiary, viz., the use of arsenical sprays on fruit trees in bloom. Bees in gathering nectar from flowers freshly sprayed become poisoned, and, worse yet, feed the poisonous honey to their young in the brood cells, with fatal results. In many states, laws carrying severe penalties have been enacted to prevent the practice of spraying trees while in blossom. No one except the ignorant or malicious would spray a tree with poisonous insecticides at this time. Spraying is obviously done to prevent insect damage, and I do not recall a single insect whose treatment requires that spraying should be done while the trees are in bloom. Where malice prompts such an action the enforcement of a law on the subject might have a salutary effect; otherwise an educational campaign is all that is needed.

[The adaptations of flowers for securing cross-fertilization were then described in detail. The structure of flowers characteristic of the *Rosaceæ*, *Ericaceæ*, *Labiatæ* and *Orchidaceæ*, was shown by colored charts and the different stages of cross-fertilization illustrated and explained. Turning from methods and details, some of the practical results of insect agencies in cross-fertilization were then considered.]

These are best seen in cases where a plant is transferred from its native environment to a new one. The early settlers of Australia, finding the soil suitable for the cultivation of clover, soon sent for clover seed and grew a splendid crop—for one year only. Similar experiments elsewhere in that country gave results equally unsatisfactory, and it was not until the bumblebee, the chief agent in fertilizing clover, was introduced that this crop was successfully cultivated.

In southern California there is an extensive area well fitted by climate and soil for the growth of figs. Many successful introductions of fig trees have been made, but in the past it has been impossible to obtain a crop of figs except by the laborious method of securing the cross-fertilization by hand labor. Even then the figs were inferior in size and quality. The peculiar flavor of the fig is due to the seeds it contains. The fewer the seeds, the poorer the flavor. Experts sent abroad by the United States Department of Agriculture, found that the Smyrna fig, the fig of commerce, was fertilized by pollen brought from the wild Capri fig by a small insect which bred in the interior of wild fruit, and emerging, covered with pollen, made its way into the cultivated fruit. The introduction of these living insects while breeding in wild figs was a task surrounded by many difficulties, and to the credit of the entomologist and other agents of the Department, it should be recorded that eventually all these difficulties were successfully overcome. Last summer, for the first time, there were grown in California Smyrna figs, of the best quality, fertilized by the imported Asiatic fig insect. The far-reaching results of this undertaking are difficult to predict, but it is certain by the successful introduction of this little insect, a new industry has been opened to the fruit growers of the far Southwest.

Such cases as these are more interesting because they are unique. Of equal importance are those which we may find in every orchard and garden. Without insect help, our fruit, berry, nut and many of our vegetable crops would be reduced to a minimum, and our finances, our comfort, and our health suffer to a corresponding degree. I am not familiar with the data of the Maine census, but in the little state of Massachusetts we raise apples to the value of $765,883; pears, $159,416; strawberries, $404,007; cucumbers, $303,699; and cranberries, $1,038,-712, a total of $2,671,717 worth of crops whose production is largely dependent on insect aid.

But even the financial side of the question—which is a narrow one at best—leads at once to considerations whose importance cannot be measured in money. Good fruit crops on the cranberry bog, in the garden, or in the orchard mean good food and clothes in the farmer's house, increased comforts in the home, and better educational facilities for the farmer's children. Thus we are led to appreciate not only the interdependence between lower forms of life, but the important relations of these forms to our own existence and welfare. Such studies bring us into closer and more sympathetic associations with the whole living world. A plant or tree is no longer a semi-animate thing; it is a living organism, endowed with needs that must be supplied, and with capabilities for service. The buzzing insect is no longer an aimless, useless creature; it is a vitalized, intelligent being, with conscious and unconscious missions. In caring for its own it becomes at once the servant of the plant and the servant of man.

Such are a few of the teachings of Nature's school. A better knowledge of animal and plant life, of that life other than our own which is all around us, cannot but be broadening to our interests and sympathies. It will enable us to attain to a fuller and better and nobler standard of living. The pages of Nature's book are always open, and in studying her teachings there is great reward.

DISCUSSION.

MR. WOOSTER: Do you think cross-fertilization in strawberries is brought about by bees or by the air; that is, which is the means by which the pistillates are cross-fertilized?

MR. KIRKLAND: In my opinion the strawberry blossoms are dependent on insects for their fertilization. While the air takes up the pollen and carries it about, it is likely to scatter it broadcast and on any other flower as well as the one to be propagated. The bee takes the pollen from the staminate and carries it directly to the pistillate and the fertilization is sure.

MR. WOOSTER: At my home there are acres of strawberry plants all in bloom, with millions of blossoms. There are practically no bees kept in the vicinity, yet the plants thrive and propagate freely. Must it not be the air that does the work? We have almost no bumble bees, and I am at a loss to see how you can make your statement as to bees hold good in this case. Again, I have noticed that plants set on the south side, where the sun shines upon them and the winds are dry and warm, propagate much better than those set on the north side where the cold, damp winds strike them. The fertilization is surely better where the air is dry.

MR. KIRKLAND: It is well known that insects fly about very little in damp weather, but when the air is warm and dry and the sun shines, then the air is full of them. This, I think, will account for the difference in location. I said bees. I do not mean by that word, simply the honey-bee. There are many members of the bee family, the honey-bee, bumble-bee, tiny boring bee, only being a few among many.

MR. WOOSTER: Is not fertilization partly due to the air?

MR. KIRKLAND: Undoubtedly, yet I think I do not say too much if I say that plants are cheifly dependent on insects for their cross-fertilization.

D. P. TRUE: How about apple trees; do they also depend upon the insect for fertilization?

MR. KIRKLAND: Yes. Some years ago during the blossoming season, the weather was very cold and damp, with only brief intervals of dry weather. That year there was almost no apple crop, due, as I believe, to the fact that insects will not fly about in damp weather.

MR. WOOSTER: Does cross-fertilization affect the seed only, or does it also modify or change the flesh, in flavor, for instance?

MR. KIRKLAND: I would refer that question to Prof. Munson.

PROF. MUNSON: I have never seen any change except in form. The question of change in form and flesh by cross-fertilization is, however, one that needs to be handled with gloves; it is not by any means a decided one. Though some experiments would seem to authorize a definite statement, yet we must be careful not to be too positive.

MR. WOOSTER: Mr. Kirkland's talk on the subject of fertilization is especially applicable to the apple, pear and plum trees. Now that he has told us how our friends among the insects help us, perhaps he will tell us how to destroy our enemies in that family.

MR. D. P. TRUE: What is the poison for the gypsy moth which the Commission is using? I have not heard of any one in Maine using it, and I should like to know more about it.

MR. KIRKLAND: It is certainly a pity if it is not used in Maine, for it is very effective. We use four or five tons of the poison every year on the gypsy moth, and get first-class results. We manufacture it ourselves, using sugar of lead and arsenate of soda. Dissolve the sugar of lead in water in a dish, dissolve the arsenate of soda in a separate dish and pour the two together. This gives a white precipitate, lead arsenate; about 11 parts of sugar of lead to 4 of arsenate of soda is the proportion. This lead arsenate is very sticky, and adheres to the leaves like death. This poison is now in the market and can be obtained of Swift & Co., Boston, and of the Bowker Fertilizer Co., of New York. They put it up in paste form in size suitable for the small orchardist. It is best for those who have large orchards to buy the ingredients and prepare the poison themselves. Get your druggist to weigh out your lead and sodium arsenate in packages, parts 11-4, dissolve in separate dishes and mix. This precipitate should be dissolved in water, proportion about one pound of lead arsenate to 10 gallons water, though we have made it one pound to four gallons water and found it did no harm. The cost is about the same as Paris green, but the labor is much less and the results far more satisfactory. The lead arsenate applied in the spring will last until the fall, and kill all insects coming in contact with it. Paris green loses its effect after each rain and in the end does not bring as good results and causes much more labor.

A MEMBER: Will it injure animals?

MR. KIRKLAND: No, not as a rule. Some few instances have been known as where a cow was tethered to an apple tree lately sprayed, and could only feed on the grass directly beneath. The cow was sick, but did not die. I also believe on one occasion, some hens died from an over-dose of lead arsenate, but with a little care there is no fear of harm.

PLUM CULTURE—A DISCUSSION.

R. H. Libby: I have been engaged for twelve years in plum culture in a small way, having some seventy-five trees. I have always had a number of varieties so that cross-fertilization might take place, and I think that essential to fruit-bearing. I set my trees about sixteen feet apart, and they have proved very profitable. Do not try to spray the black knot. This is a fungous growth which comes two or three times a year and you must cut it out. It is sometimes well to bathe the knot in turpentine or kerosene, but the best thing to do is to watch carefully, and as soon as you see a knot cut it out and burn it. The orchardist ought to cut down every cherry tree he sees with a black knot on it, for self-protection if nothing else. Clean culture, careful attention, and good cultivation are all necessary to successful plum growing.

C. S. Pope: Do not be discouraged by the black knot. The New York Experiment Station at Cornell University says, that by spraying with Bordeaux mixture you can hold the black knot in check, and I have had very good results with the same method. It forms a coating on the limb and keeps off the spores. Any way, it is a very good plan to spray the plum tree with Bordeaux mixture, and it is also well to add a little Paris green. But if you see a black knot there is just one thing to do, cut it out.

C. S. Phinney: I have for the past few years had many plum trees, and I hope to have more. I ordered about six years ago about ten Japanese plum trees from a dealer. He sent me some, saying that they were not very good, and I set them out. Four of these did well. Two years ago I set out about a hundred trees, and to-day I have from one hundred and fifty to one hundred and seventy-five trees, some having fruited twice, and many not at all. I have here some shoots from a Burbank fully budded out, from a tree which bore about $20 worth of plums last year; also a Wixon and an Abundance, fully budded. The Abundance bore a very good crop in 1898, and a fair one in 1899. It is a very good plan if you have an orchard of young apple trees, to set your plum trees between these and then give good cultivation to both. This can be done at a normal cost and with little labor. I consider the Burbank the best plum for canning, it having a nice flavor and being of good size and texture. The Abundance is the best plum for table use, being of exceedingly fine flavor. I have found in my experience that the New England plum is very much better flavored than the California plum.

A MEMBER: Are your plums as large as the California plums?

MR. PHINNEY: The Abundance can be grown to nearly the size of the California plum if you keep your trees pruned, but if they are allowed to thicken up the fruit is small.

A MEMBER: What kind of soil is best for plum trees?

MR. PHINNEY: I think corn soil is about as good as any. These Japanese varieties bloom early, so must be set on high ground to avoid early frosts. I also raise Hale and Red June. The Hale is inclined to black knot, but by keeping premises clear you ought to avoid that. The Hale and Red June have never fruited, with me.

A MEMBER: Do you raise any of the European varieties, Mr. Phinney?

MR. PHINNEY: No; I raise no European varieties. I find the Japanese good enough for me.

J. W. TRUE: In New Gloucester the Lombard is very well known and used for canning to a great extent. Do you think the Burbank better?

MR. PHINNEY: I think the Burbank just as good as the Lombard for canning, if not better.

C. S. POPE: Do not get carried away with the Japanese. I have found the European full as hardy and just as good producers. The Red June all died out with me, and the Burbank and Abundance are the only hardy ones. If you want quality in your fruit you must cut back your trees one-half or two-thirds, or more. I also think that the Burbank is a good canning fruit. I think the blue damson superior to any of them. It is a great seller on account of its rich color and flavor. The Imperial, Gage, Reine Claude and McLaughlin are also very fine varieties. All stone fruits should be grafted in the early spring before the frost comes out. Either form of grafting, cleft grafting or splice, can be used with good success.

D. P. TRUE: Twenty-five years ago I started in on plum culture on quite an extensive scale, having about one hundred and fifty trees. From these the best year I ever had I raised only forty bushels. I believe that is because I let the trees get too thick and large and did not prune them as I ought. One day I discovered a black knot, and soon my entire orchard was affected, and I had to cut down every tree I had. I found the Lombard very susceptible to black knot. I also consider the Burbank very good for canning.

R. H. LIBBY: It is an absolute necessity to prune your trees and reduce your fruit. If your trees are too heavily loaded they are sure to die.

PROF. MUNSON: Keep your trees cut back within a reasonable limit, as this is for the best interests of the tree. Produce your fruit near the body of the tree and take the weight from the ends of the limbs, as the wood of the plum tree is brittle and overloading will break it down.

J. W. TRUE: How can you kill the black knot?

PROF. MUNSON: The black knot is a fungous growth. The vegetative part of the fungus is within the knot, eating away the fibre of the tree, the "knot" being simply the fruiting portion. You must cut it out as soon as it appears. Do not let the limb stay, because it is loaded with fruit, but cut it off and save your orchard.

TILLAGE AND PRUNING IN THE ORCHARD.*

PROF. W. M. MUNSON, Orono.

The subject of tillage is so commonplace that one seldom thinks of it as having had a history, as being the result of a slow process of evolution. Doubtless the principal reason that most persons would give for tillage, if asked for a reason, would be that they are obliged to do it to secure a living. To till the soil would seem to be the simplest and dullest thing in the world. The simple guiding of the plow, or following of the harrow, or it may be "the man with the hoe," is brought to mind. If viewed only as labor, to be most quickly and easily disposed of, this conception of tillage is a natural one; the work must be done because in some way plants thrive best when it is done.

From the earliest times tillage has been a mere necessity, forced upon the husbandman by natural conditions. The first step in its evolution was doubtless the breaking of the earth to get in the seed; the second was the removal of other plants (weeds) which interfered; the third was the stirring of the soil in harvesting certain crops. In course of time men began to realize that there was something in the practice which aids the growth of plants, wholly aside from the lessening of the conflict with weeds. Not until the last century, however, was there any serious attempt to discover the reason for the beneficial effect observed. Jethro Tull, in advocating his horse-hoeing husbandry, while misapprehending the reason for beneficial effect, did a grand work in inducing farmers to till for the sake of tillage.

The immediate effect of tillage is to ameliorate and modify the soil itself. Its secondary and most important effects are directly concerned with the plant. Food materials are set free; the process of nitrification is promoted; the capillarity of the surface soil is lessened, and thereby moisture is conserved.

*The two operations here discussed are among the most important in the management of orchards. Those interested in a fuller discussion of the subject will do well to study Roberts' Fertility of the Land, and Bailey's Principles of Fruit-growing, from both of which I have drawn freely.—W. M. M.

Now the soil is a vast storehouse of plant food, and the first effort of the husbandman should be to make this store available to plants.

In discussing the culture of any class of plants it is important to consider just how the processes of nutrition are carried on, that we may know the reason for the operations performed and the effect likely to be produced by any given operation. A plant derives the greater portion of its food from the soil in the shape of soluble inorganic materials. These materials ascend to the leaves, through the young wood, and then, by the action of sunlight, become changed into organized compounds like starch, sugar, etc. These organized compounds are used in the repair and growth of all parts of the plant, and they are therefore distributed to the leaves, twigs, trunk and roots. The growth of the roots is, therefore, largely determined by the amount and vigor of the leaf-bearing surface, while the latter is also dependent on the ability of the roots to secure the necessary inorganic elements.

For practical purposes the benefits of tillage may be concisely given under three general heads, viz.:

(a) Tillage improves the physical conditions of the soil.

(b) Tillage conserves moisture.

(c) Tillage may augment chemical activities.

The physical condition of soil is nearly always of more importance than mere richness in plant food. Particularly is this the case with such lands as remain hard or lumpy if left to themselves. The chemical composition of a soil is not necessarily a measure of productive capacity, since plant food is of no consequence, unless the plant can make use of it. Every farmer knows that hard and lumpy soil will not grow good crops, no matter how much fertilizer he may apply, and there is no doubt that the number of "worn-out" farms in New England is much smaller than is generally supposed. Any clay soil may be so injured by one season's injudicious treatment as to render it comparatively worthless for several succeeding years. It is useless to apply commercial fertilizers to lands which are not in proper physical condition for the best growth of crops. The average New England hillside contains a sufficient amount of food material, and tillage, by improving the texture of the soil, is the key which is to unlock this store. More than two hundred years ago, Samuel Hartlib wrote, "Men take him for a fool or a madman that, having store of wealth in his trunk, doth yet complain of want. What though the key be rusty for want of use? 'tis easier to get that scoured than to obtain such another treasure."

By fining the soil and thus increasing the feeding surface of the roots; by increasing the depth and thus giving a greater foraging area; by warming and drying the soil in spring; and by reducing the extremes of temperature and moisture, the physical condition will be rendered best for the unlocking of the treasure.

As already stated, the food materials must be in solution in order to be of use in building up plant tissue. Now the amount of water which falls during the growing season is entirely inadequate to the growth of plants during that time. For this reason it is important that the water holding capacity of the soil be increased as much as possible, and that some means of checking evaporation be adopted. Both of these conditions are best brought about by tillage.

Naturally those soils which are most open and most porous, which contain the largest number of spaces between the particles, will retain the moisture to the best advantage, and will give the best opportunity for the roots of plants to penetrate them and take up the moisture there stored,—in the same way that a sponge will take up a larger amount of water than will a block of wood. By deep plowing and thorough working, and the addition of organic matter, this spongy condition desired is obtained.

The effect of an old board, or a log or a stone wall in encouraging the growth of grass or weeds along the roadside is familiar to all. The reason for this is that the moisture underneath this board, or stone wall, is unable to escape, except as it is pumped out by means of the roots of the plants. The grass in the open field is dwarfed and stunted because of the excessive number of plants crowding one another in the struggle for existence, and the fact that there is nothing to hold the moisture accumulated in the soil. So, in addition to the continual pumping by the plant, there is constant evaporation from the surface of the soil. In order that the best results be obtained, some means must be devised to check this evaporation, and there is no better way than by breaking the capillary pores near the surface by frequent, shallow cultivation; in other words, by providing a blanket of fine, dry earth. The blanket of fine earth will serve the same purpose in holding the moisture back, as will the board, or stone wall already referred to. Now if we are growing corn, or potatoes, or any other hoed crop, we wish this particular crop to serve as the medium for taking up the food and moisture stored in the soil. The presence of weeds in a given area is pernicious, not so much because of the crowding of the plants that we are growing, although this is a serious drawback, as it is an indication that the blanket of earth referred to is lacking and, consequently, that the moisture which we should conserve is being carried to the surface by capillary attraction and dissipated in the atmosphere.

The value of tillage in aiding chemical processes is recognized by all. By warming the soil and admitting oxygen, the decomposition of organic matter is hastened, plant food is set free, and nitrification is promoted. The simple statement of these facts is, perhaps, sufficient at this time.

Now that we have come to understand why the stirring of the soil makes plants thrive, the feeling of drudgery in tilling the land is lost, and the operation becomes one of the most important and suggestive of all farming operations. We recognize the fact that we must till for tillage's sake; that the purpose of tillage is not simply to kill weeds, but is rather to conserve moisture, pulverize the soil, and destroy the conditions favorable to the presence of insects and other enemies.

In the management of orchard lands it is not so much a question how the tillage shall be performed, as that it be given. Many of our best orchard lands are so situated that ordinary tillage by means of the plow and harrow are utterly impracticable. In such cases the use of hogs is to be highly commended. I am aware, in touching upon this subject, that I am treading upon dangerous ground, but from practical observation, I am convinced that the hog may often be used with excellent results upon orchards which have reached a bearing age. The practice in this case would be to use shoats rather than hogs a year or more old. If six or eight hogs are put in an enclosure of about an acre, if not too highly fed, they will, during the season, pulverize the soil as completely as could be done with plow and harrow, and will, in addition, serve an important purpose in destroying fruit infested with noxious insects.

PRUNING.

One of the most important characteristics of any plant is the fact that its various parts are unlike; that each branch is, in a measure, independent and capable of becoming a new individual. On this fact rests the philosophy of the pruning of plants.

There is an intense struggle for existence among all organisms, and changes in the numbers and characters of individuals are largely a matter of environment and of readjustment between different types. Each kind is held down to a certain equilibrium in relation to other kinds by the struggle with those kinds and with individuals of the same kind. The greater the number of pigweeds in a given field, the less is the opportunity for another pigweed to gain foothold. The same is true of the strawberry or any other plant of value to man.

Now a tree is essentially a collection or colony of individuals. Every branch is endeavoring to do what every other branch does—i. e., to bear leaves, flowers and fruit. So every branch competes with every other branch, and there are more germs of branches—buds—than can possibly be supported upon any tree. As with individual plants, so with branches—no two are exactly alike, but each is what its position or condition makes it. Some are strong and some are weak. There is no fixed shape or size for any.

Granting this position, we see that there is a struggle among the branches; all are not necessary to the life of the tree; the removal of the useless ones will serve to the improvement of the remaining ones. In other words, pruning is a necessity.

It is commonly asserted that cutting off a large limb is injurious because a given amount of tissue, in the formation of which the plant has expended effort, is thus summarily cut off. In other words, it is assumed that a plant has a fixed vitality from which a certain amount is withdrawn whenever a portion of the plant is cut away. This assumption is wholly gratuitous. The vitality of the plant is very largely determined by the conditions under which it grows—the soil, the surroundings and the treatment. Furthermore, since plants have no nerves, they cannot die of shock, as is sometimes alleged. If the plant is largely what its food supply and other environments make it, then the removal of a portion of it cannot be injurious unless the removal is so great as to interfere with the nutrition of the remaining parts, as already explained.

It is often urged that pruning should be commenced when the tree is planted and continued annually throughout the life of the tree. It may be a question, however, if we really save a proportionate amount of time, or preserve a better growth of the tree, by early pruning; that is, whether equally good or better results may not be obtained by removing superfluous branches at four, five, or six years of age, rather than by pruning very early in the lifetime of the tree. As already suggested, there is an exact balance between the feeding capacity of the plant—that is, its root system and food supply—and the superficial growth. If we have an active, efficient root system, the top will be correspondingly large. If now, a large part of the top is removed, there is an endeavor to restore the balance by an unusually rapid growth. Pruned plants are almost always more vigorous than unpruned ones because the food taken up by the roots is concentrated into a smaller number of branches. Pruning must, in a measure, then, have taken the same effect as manuring, since the stimulating effect of the new growth must be felt upon the root system also.

Let us take a concrete example, recorded by Bailey*: "Two Siberian crab trees were set in the spring of 1890. The trees were as nearly alike as possible and set but 25 feet apart. In 1891, the trees made nearly a uniform growth. During the winter one of the trees was severely pruned, the pruning amounting to 460 inches of wood, of which 432 inches was new wood. The other tree was not pruned. During 1892 the unpruned tree produced 118 new twigs with a total length of 1,758 inches, while the pruned tree produced 120 new twigs and made a total growth of 1,926 inches. The pruned tree, therefore, made 14 feet more growth than the other, which is a large proportion for a tree only three years set; and the growth was stouter upon this tree also. In

* Pruning-Book, p. 15.

other words, a tree from which about forty feet of branches had been cut bore, at the end of a single season, fourteen feet more wood than a similar tree which had not been pruned."

Of all the operations connected with the growing of trees and shrubs, pruning and training, bring the person into closest contact and sympathy with the plant. The true lover of plant life shapes and cares for his plants as thoughtfully and works out his ideals as carefully as he would train and guide a child, and the man who cannot feel this sympathetic contact with his plants is the one who uses an axe in pruning.

It is astonishing, however, to find how little the average orchardist thinks of the actual problems at issue with pruning of his trees. To treat even a few of these problems exhaustively would require much more time than can be given to the subject on this occasion. A few important points suggest themselves for discussion, however. As has already been seen, an important effect of pruning is to increase vigor. Pruning is also practised to produce larger and better fruits and flowers; to keep the plant within manageable limits; to remove superfluous or injurious parts; to facilitate spraying, tillage and harvesting; to train the plant to some desired form.

One of the noticeable effects of severe pruning and the consequent disturbed equilibrium of the plant is the formation of water sprouts. The appearance of the water sprouts seems to be influenced more by the vigor of the plant and the amount of pruning than by the season of the year in which the pruning is done. It is probable, however, that fewer water sprouts will arise if pruning is done after midsummer, since at that time the growth of the season is completed. In any case, water sprouts may be regarded as weeds in the tree top and should be treated as such.

The tendency of plants is to grow from the uppermost buds. By pruning in one way this tendency is augumented, in another it is checked. As a rule, in dealing with fruit trees, the latter end is desired, since the principle that checking growth induces fruit fullness is universally recognized. The heading in of young growths tends to develop lateral and dormant buds or to thicken the top. So that the question of heading resolves itself into a question of personal ideals. To secure a thick topped tree it is necessary.

It has, however, the further very marked advantage of inducing the development of fruit buds near the body of the tree rather than far out on the limbs. This, in the case of plums and tender wooded plants, is an important consideration.

Fruit bearing is determined more by habitual performance and by the condition of the plant than by the kind or extent of pruning. In other words, it is to a certain extent an individual characteristic. Pruning may, however, be made a means of thinning the fruit and thus improving both the size and quality of that which remains, by removing shoots upon which fruit-buds are borne.

But here it is important that the operator knows the manner in which the plant bears its flower-buds. Heading back the annual growth thins peaches, quince, raspberries, blackberries, black currants, and to a certain extent, red and white currants and grapes, all of which develop flower-buds on the wood of the last season. With the apple and pear, of course older limbs must be removed.

Pruning, by thinning the fruit, may have a very important, though indirect effect in controlling the bearing year of many plants. If an individual fruit spur be carefully studied, it will be seen that there is usually an alteration in fruit bearing for the reason that the demands made by the fruit are so great that a fruit-bud cannot develop the same year. So in the bearing year, a leaf-bud develops to continue the spur the following year; and this following or barren year, a fruit-bud is developed for the succeeding year. Alternate years fruit bearing is then largely a question of food supply. If we wish to make a tree bear every year, it is necessary either to supply more food material, or to remove a portion of the fruit.

Since in large fruits one spur bears one fruit, the alternate bearing of individual spurs will continue and it will be necessary to remove all of the fruit from individual spurs, thereby allowing a portion of the spurs to bear one year and others the next. It is doubtful, however, if any amount of thinning can produce an annual bearing habit unless the trees receive other necessary good care. It is probable that the better course to pursue in attempting to get fruit every year, is to change the bearing year of entire plants through a part of the orchard and allow these to bear one year and others the next year. It is not to be understood that these results will always follow, but the tendency is in the direction indicated.

The season in which pruning is done has some influence on fruit bearing since winter pruning tends to produce wood, while summer pruning does not. The healing of the wound is, however, but slightly affected by the season in which the cut is made. Theoretically, the best time to make the cut, so far as healing is concerned, is in the early part of the season, since the healing process then begins without delay. Other factors, such as the general vigor of the plant, the position of the branch, the length of the stump and the character of the surface, are chiefly concerned in this matter. It may not be out of place, in this connection to refer for a moment to the treatment of large wounds, when it is necessary to make such.

As to the manner of making the cut, the rule laid down by Prof. Sargent is perhaps as clearly stated as possible: "It is necessary to prune in such a manner that no portion of an amputated or dead branch shall be left upon the trunk. The cut should always be made close to and even with the outline of the trunk, without regard to the size of the wound thus made. This is the essential rule in all pruning, and on its observance the success of the operation depends."

Wounds of any considerable size should be given a coating of paint or some other durable substance. A suitable dressing must possess two distinct properties. It must check the weathering of the wound and prevent the growth of bacteria and fungi, and it must be of such a nature as not to injure the surrounding bark. The dressing is of no value in the healing of the wound, except as it prevents decay. For general purposes, a white lead paint is most satisfactory. It is an antiseptic, and it adheres closely to the wood. Wax, shellac, tallow, etc., are lacking in both respects. Bordeaux mixture would be an admirable material for this purpose if it were more durable.

It is often said that all pruning should be done with a pocket knife. In other words that the pruning should be so carefully looked after that the removal of large branches would not be necessary. Theoretically this may be true, but practically such close attention cannot be given, and it is often impossible to tell which branches should be removed until they have reached considerable size. The most essential pruning tools are a good strong knife, hand shears and a narrow saw. Various modifications of these tools are offered, but simplicity is usually to be desired.

To summarize: Modern ideas and practice of tillage are the product of a gradual process of evolution. The beneficial effects are undeniable, and are manifested in an improved physical condition of the soil. In the conservation of moisture, and in the augmenting of chemical activities, in the management of orchard lands, the fact that tillage is practiced is more important than the method employed.

The philosophy of pruning rests upon the fact that each branch of a plant is, in a measure, independent, and that there is never competition between these members. Pruning is not injurious *per se*, and is often of great benefit, but damage often results from the careless or injudicious use of the knife. Fruit bearing, while to a certain extent an individual characteristic, may be greatly modified by judicious pruning and thinning.

The season at which pruning is performed is of less importance than is the manner of making the cut and the treatment of the wound.

DISCUSSION.

C. S. PHINNEY: In the case of propping up limbs heavily laden with fruit, does the bending of the limb injure the vitality of the tree?

Prof. MUNSON: Yes, the twisting of the wood undoubtedly checks the growth of the tree. There is no doubt that we seriously abuse our orchards by permitting them to bear such loads of fruit. We do not thin the fruit sufficiently. I should say thin the fruit rather than prop the trees.

MR. PHINNEY: Then you think that the propping checks the growth of the tree?

Prof. MUNSON: Yes, the twisting of the limbs will tend to this. I may say that twisting of limbs is a method sometimes employed to throw trees into bearing; it checks the growth. The great object of nature is to perpetuate the kind. If a plant is crowded it always has a tendency to produce seeds, to perpetuate itself. Girdling the limbs and pruning the roots also tend to check the leaf-buds and increase the fruit-buds.

L. GURNEY: I should like to ask Prof. Munson if he thinks that it is a good idea to make trees bear every year?

Prof. MUNSON: If your trees are of the annual bearing kind you can make them bear every year. By proper feeding and pruning you ought to make any tree bear.

Mr. GURNEY: If you work your tree every day it cannot live as long, can it, any more than a man?

Prof. MUNSON: True, but we can get more out of it while it does live. So in the case of man; we live faster while we do live than did our ancestors, but not so long.

T. M. MERRILL: I should like to ask the professor at what age he would advise setting trees from the bud?

Prof. MUNSON: Two years is about right, I should say.

Mr. MERRILL: Should you wait two or three years before trimming out your young trees after setting?

Prof. MUNSON: I should trim at time of setting.

Mr. MERRILL: Should you trim to a whip?

Prof. MUNSON: Not in the case of apple trees, leave two or three branches, or at least stubs, to increase leaf surface so as to strengthen the root system of the tree.

Mr. MERRILL: I have had the best success in trimming my trees to a whip, cutting off all branches, clipping off the tops wherever I can find three buds, and leaving a good spur to be removed later. I always like to have three buds running out at different angles and to leave a good spur above, so when this withers down it will not kill the buds; the spur should be two or three inches long. This makes a good head and I have had good success with it.

E. W. WOOSTER: What do you think of the necessity of pruning the trees so as to present the most surface to the sun?

Prof. MUNSON: Serious damage has often resulted from this mode of pruning, as it allows too open a head, and trees are injured by sun-scald. It is well to leave small branches in the body of the tree. Do not trim large branches to a whip but leave the twigs to shade the branches.

A MEMBER: In setting trees, is it a good plan to remove all the roots?

Prof. MUNSON: I do not consider this practice best in New England. I think it has not been tried here to any extent. The method has been followed in the South with very good results. We need more surface from which roots shall start out, here in New England, so I favor leaving the young roots.

Mr. MERRILL: Mr. Phinney has had practical experience in reclaiming old orchards and I should like to hear from him.

Mr. PHINNEY: I bought in the spring of 1891 an old orchard of about two hundred trees which were set out about twenty-five years ago. Of these about a hundred and twenty-five were what you might call fair trees, the rest were past redemption. The previous owners of the orchard had never got more than forty barrels of apples a year from them and thought that no more could be got. That spring of 1891, I pruned all the trees, ploughed up the ground, and planted a crop of potatoes, using fertilizer liberally. The next year I sold four hundred dollars' worth of apples from this orchard. I have cultivated the orchard every year, except one; that year I let the grass grow, then turned the sod under. I have used a commercial fertilizer every year and pruned moderately. My fertilizer is made up of about 3% ammonia, 8-10% phosphoric acid, 10-12% potash in the form of muriate. I give to every tree 10 to 20 pounds of fertilizer every other year, depending, of course, on the size of the tree. In 1898 I planted a crop of potatoes in among the trees, not for the potatoes I might get, but to cultivate the trees. In 1899 I did not plough, but cultivated with a spring-tooth harrow, about ten times, I should think There has never been a year but what I have got a fair crop, this year I believe I got two hundred and seventy-four barrels.

A MEMBER: How did you apply your fertilizer and what is the cost?

Mr. PHINNEY: I sow my fertilizer broadcast. It costs about a cent and four-fifths a pound, or $28 a ton.

A MEMBER: Do you spray your trees?

Mr. PHINNEY: Yes, I have sprayed every year with Bordeaux mixture and Paris green and have had no trouble from insects. I do not believe there is the least need of being troubled by the caterpillar.

Mr. MERRILL: How long did it take you to get your trees into shape by pruning?

Mr. PHINNEY: I cannot say that I feel entirely satisfied with them now. I think it very essential to remove the tops, especially of the Northern Spies. This should be done gradually.

Mr. MERRILL: Did I understand Prof. Munson to say that one should not prune with an axe?

Prof. MUNSON: I do not know that I did say so, but I do say so now. Use a saw, then you are not so likely to do harm to the tree. Make two cuts, one at least a foot from the trunk, then one close to the trunk. This will prevent splitting.

PEAR CULTURE—A DISCUSSION.

D. P. TRUE: Bartlett pears have not been raised successfully here.

L. GURNEY: I raise good Bartletts.

Prof. MUNSON: You must be on high ground.

Mr. GURNEY: How about the Lawrence? I have raised some fine Lawrences and think them a good winter pear.

D. P. TRUE: Some like the Lawrence and in certain localities it does very well. The only two winter pears which I have found any good, however, are the Beurre de Anjou and Vicar of Winkfield. These I have had great success with and know, in my experience, are the best.

C. S. PHINNEY: What kind of soil is best for pear trees, the same as for apple trees, rocky soil, or clayey soil?

D. P. TRUE: I should say the rocky soil would be the best.

J. W. TRUE: Have you had much success with the Flemish Beauty?

D. P. TRUE: I have had a few trees and raised some fine fruit.

J. W. TRUE: Has spraying prevented cracking, in this variety?

D. P. TRUE: I sprayed my Flemish Beauties in the spring and had no cracks. I can't say whether the result was due to spraying or not.

J. W. TRUE: Did the Flemish Beauties russet?

D. P. TRUE: No, they were fair and red-cheeked.

E. W. WOOSTER: Were you ever troubled with pear blight; that is, about June have your trees turn brown, then black, then died altogether?

D. P. TRUE: Yes, and I have found that, as a rule, there is no help for it. If it only attacks a limb, cut off your limb and burn it. However, I have had many beautiful trees blight and I laid it to too much animal manure.

MR. WOOSTER: I sent to Rochester some years ago and got quite a number of pear trees, dwarfs and standards, Clapp's Favorite and Sheldon and six trees of a variety I don't know what. These six trees have borne about ten pears which are striped like a Bartlett. The trees all blossom well but the blossoms fall and they don't bear. The trees are thrifty and apparently hardy, they grow different from any trees I ever saw. The limbs grow in a sort of a curled up shape instead of straight. I should like to know what variety the tree is and the cause of its not bearing.

D. P. TRUE: I can't tell you the variety, but I should advise your using the trees for stock and graft to some other variety.

Mr. WOOSTER: I also have some Clapp's Favorites and Flemish Beauties which I can't do a thing with. They bear fruit about as big as your thumb and hard as a rock. Over in Sullivan, at the same latitude and in the same kind of soil, these varieties do well.

Prof. MUNSON: You must watch and spray. Evidently the pear scab has attacked your trees. You can also prevent blighting and cracking by spraying with the Bordeaux mixture. I call to mind an article I read some little time ago, saying that the Anjou could not be grown in New England. Mr. Libby has shown the fallacy of that statement for he grows very fine trees and says he thinks them the best winter pear.

Mr. GURNEY: I raise the Duchess and think that a pretty good pear.

D. P. TRUE: That is a fall pear, I believe, ripening in the middle of October and will keep till some time in November.

MR. WOOSTER: What shall I graft those trees of mine to?

Mr. GURNEY: Try the Sheldon.

Mr. WOOSTER: The Sheldon won't grow where I live.

D. P. TRUE: I would advise your looking around among your neighbors and finding some variety that has proved a success.

APPENDIX.

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
Andrews, Charles E............. Auburn
Arnold, C. A ....Arnold
Atherton, Wm. P .... Hallowell
Atkins, Charles G ....Bucksport
Atwood, Fred........ ....Winterport
Averill, David C ....Temple
Bailey, W. G ....Freeport
Bennoch, John E .... Orono
Bickford, Lewis I.......Dixmont Centre
Bisbee, George E ....Auburn
Blanchard, Mrs. E. M.......... Lewiston
Boardman, Samuel L............Augusta
Briggs, John .... Turner
Burr, John ....Freeport
Butler, Alonzo......................Union
Chandler, Mrs. Lucy A ....Freeport
Chase, Henry M., 103 Federal St., Portland
Chase, Martin V. B .... Augusta
*Cole, Horatio G............ Boston, Mass
Corbett, Herman ....Farmington
Crafts, Moses .... Auburn
Crowell, John H ....Farmington
Cummings, Mrs. Anthony ....Auburn
Dana, Woodbury S.............. Portland
Dawes, S. H.............. ....Harrison
DeRocher, Peter ....Bradentown, Fla
Dirwanger, Joseph A ....Portland
Dunham, W. W................North Paris
Dyer, Milton . ...Cape Elizabeth
Emerson, Charles L .... South Turner
Farnsworth, B. B .... Portland
Frost, Oscar F................. Monmouth
Gardiner, Robert H........ Boston, Mass
George, C. H.......................Hebron
Gilbert, Z. A................North Greene
Goddard, Lewis C ....Woodfords
Grover, Franklin D ....Bean
Gurney, Lemuel.. .... Hebron
Hackett, E. C............West Gloucester
Hall, Mrs. H. A....................Brewer
Hanscom, John.......................Saco
Harris, N. W........................Auburn
Harris, William M.. ....Auburn
Harvey, F. L .... Orono
Hobbs, M. Curtis......West Farmington
Hoxie, James S...........North Fairfield
Hoyt, Mrs. Francis............. Winthrop
Jackson, F. A................... Winthrop
Johnson, Isaac A ....Auburn
Keene, Charles S...................Turner
Knowlton, D. H..............Farmington
Lapham, E. A .... Pittston
Litchfield, J. H ....Auburn
Lombard, Thurston M........... Auburn
Luce, Willis A. ....South Union
McLaughlin, Henry...............Bangor
McManus, John............... Brunswick
Merrill, T. M ....West Gloucester
Mitchell, Frederick H.............Turner
Moody, Charles H. ....Turner
Moore, William G. .... Monmouth
Moor, F. A...................... Waterville
Morton, J. A...........................Bethel
Page, F. W........................ Augusta
Parsons, Howard G.......Turner Center
Perley, Chas. I...................Cross Hill
Pope, Charles S .... Manchester
Prince, Edward M ....West Farmington
Pulsifer, D. W........................Poland
Purington, E. F........West Farmington
Richards, John T... ....Gardiner
Ricker, A. S ....Turner
Roak, George M................... Auburn
Robinson, Henry A............. Foxcroft
*Rolfe, Samuel...................Portland
Sanborn, Miss G. P............... Augusta
Sawyer, Andrew S. ......Cape Elizabeth
Sawyer, George B..............Wiscasset
Simmons, H. J. A ....Waldoboro
Skillings, C. W............North Auburn
Smith, Henry S................Monmouth

*Deceased.

LIFE MEMBERS—CONCLUDED.

Snow, Mary S.......... Bangor
Starrett, L. F.......... Warren
Stetson, Henry.......... Auburn
*Stanley, Charles.......... Winthrop
Stanley, O. E.......... Winthrop
Stilphen, Asbury C.......... Gardiner
Strout, S. F.......... West Falmouth
Taylor, Miss L. L., (Lakeside) Belgrade
Thomas, William W., Jr.......... Portland
Thomas, D. S.......... North Auburn
Thurston, Edwin.......... West Farmington
Tilton, William S.......... Boston, Mass
Townsend, Mrs. B. T.......... Freeport
True, Davis P.......... Leeds Center
True, John W.......... New Gloucester
Vickery, James.......... Portland
Vickery, John.......... Auburn
Wade, Patrick.......... Portland
Walker, Charles S.......... Peru
Walker, Elmer V.......... Oxford
Waterman, Willard H.......... East Auburn
Wheeler, Charles E.......... Chesterville
Whitney, Edward K.......... Harrison
*Woodman, George W.......... Portland
Yeaton, Samuel F.......... West Farmington

ANNUAL MEMBERS, 1898.

Abbott, L. F.......... Lewiston
Beal, Lewis.......... Skowhegan
Beal, S. H.......... Skowhegan
Benson, Mrs. G. S.......... Skowhegan
Burr, Perez.......... Freeport
Churchill, E. P.......... Hallowell
Cook, Elijah.......... Vassalboro
Crowell, Mrs. E. H.......... Skowhegan
Dudley, J. W.......... Castle Hill
Eaton, Anna A.......... Augusta
Jewett, Frank W.......... Hallowell
Kyes, Mrs. R. W.......... North Jay
Litchfield, L. K.......... Winthrop
Macomber, Arthur C.......... North Jay
McKeen, B. Walker.......... Augusta
Munson, W. M.......... Orono
Niles, Silas H.......... North Jay
Nowell, F. E.......... Fairfield
Paine, Mrs. E. E.......... Jay
Shepard, L. G.......... Orono
Tarr, Edward.......... Castle Hill
Titcomb, B. M.......... Farmington
Toothaker, L. P.......... Simpson's Corner
Wallis, Belle.......... Brewer
Young, Bert L.......... Augusta

ANNUAL MEMBERS, 1899.

Abbott, L. F.......... Lewiston
Cook, Elijah.......... Vassalboro
Cook, Mrs. Sarah F.......... Vassalboro
Cook, Miss Eva L.......... Vassalboro
Davis, F.......... Newport
Deering, Mrs. R. A.......... Newport
Eastman, A. A.......... Dexter
Folsom, C. A.......... Palmyra
Grant, Mrs. Alice.......... Newport
Leland, Will E.......... East Sangerville
Libbey, R. H.......... Newport
Libbey, Mrs. Clara M.......... Newport
Marsh, Mrs. J. B.......... Newport
Munson, W. M.......... Orono
Nowell, F. E.......... Fairfield
Phinney, C. S.......... Standish
Pope, Mrs. M. E.......... Manchester
Sturgis, C. G.......... Auburn
Tarr, E.......... Mapleton
Twitchell, G. M.......... Augusta

* Deceased.

TREASURER'S REPORT.

CHAS. S. POPE, TREASURER, in account with Maine State Pomological Society.

1899.	DR.	
Jan. 2,	To cash from Treasurer 1898	$46 80
	First National Bank, Farmington, interest on stock,	20 00
	Farmington Water Company, interest on stock	8 00
	Merchants' National Bank, Gardiner, interest on stock	6 00
	State stipend	1,000 00
	life membership fees	20 00
	annual membership fees	20 00
		$1,120 80

1899.	CR.	
June 5,	By paid W. M. Munson, expenses, postage, etc	$19 10
	E. Cook, expenses, postage, printing posters, etc	12 43
	J. W. True, expenses, postage, etc	7 05
	Miss G. P. Sanborn, expenses	5 30
	L. F. Abbott, expenses	3 39
Aug. 16.	Lewiston Journal Co., letter heads and envelopes	7 50
	C. S. Pope, expenses, postage, revenue stamps, etc	13 80
	W. M. Munson, expenses	5 50
Nov. 17.	Geo. T. Powell, expenses and services at Newport	37 67
	A. E. Andrews, expenses to Augusta	1 00
	E. Cook, expenses and sundries	13 55
	Maine Farmer Publishing Co., printing premium lists, etc.	18 75
	E. W. Smith, board of officers and speakers at Newport	33 50
	R. H. Libbey, services and expenses	5 00
Dec. 9.	E. W. Wooster, expenses attending Newport meeting	2 40
	Elijah Cook, express bills and expenses at Newport	15 25
	Premiums awarded at Newport	269 50
	Smith & Reid, binding Transactions 1898	7 87
	E. Cook, clerk hire	8 00
	Chas. S. Pope, salary and expenses	34 10
	Augusta Safe Deposit and Trust Co., box rent	5 00
	Augusta Safe Deposit and Trust Co., to credit of permanent fund	20 00
Dec. 30.	Miss G. P. Sanborn	6 00
	W. M. Munson, expenses to Newport and Augusta	17 35
	Elijah Cook, salary	100 00
	John W. True, expenses and express bills	8 15
*Cash in hands of Treasurer		432 79
		$1,120 80

* The greater part of this amount was reserved for the expenses of the winter meeting, January 18 and 19.

PERMANENT FUND.

		DR.
To stock, First National Bank, Farmington		$400 00
	Merchants' National Bank, Gardiner	100 00
	Farmington Water Company	100 00
	Augusta Safe Deposit and Trust Company	690 00
		$1,290 00
Loss by scale down in stock of Merchants' National Bank, Gardiner		100 00
		$1,390 00
		CR.
By 137 life members to January 1, 1899		$1,370 00
membership fee of John McManus, Brunswick		10 00
	Lewis I. Bickford, Dixmont Centre	10 00
		$1,390 00

FINANCIAL CONDITION OF THE SOCIETY.

Bounty due from the State	$1,000 00
Due from the Maine State Agricultural Society	150 00
Permanent fund	1,290 00
Property owned by the Society	200 00
Interest due (estimated)	40 00
Cash in the treasury	432 79
	$3,112 79

I hereby certify that I have examined the foregoing accounts of the Treasurer of the Maine State Pomological Society for the year 1899 and find them correctly drawn. I also find there is the sum of four hundred thirty-two and 79-100 dollars ($432.79) in the treasury.

Z. A. GILBERT, *Auditor.*

March 9, 1900.

APPENDIX II.

ACT OF INCORPORATION.

STATE OF MAINE.

IN THE YEAR OF OUR LORD ONE THOUSAND EIGHT HUNDRED AND SEVENTY-THREE.

An Act to Incorporate the Maine State Pomological Society.

Be it Enacted by the Senate and House of Representatives in Legislature assembled, as follows:

SECTION 1. Z. A. Gilbert, George W. Woodman, A. L. Simpson, George B. Sawyer, J. C. Weston, Charles Pope, Samuel Rolfe, James A. Varney, Albert Noyes, Rufus Prince, J. C. Madigan, S. F. Perley, Hannibal Belcher, J. B. Phillips, Joseph Taylor, Harvey Counce, John Currier, William Swett, Henry McLaughlin, Calvin Chamberlain, Washington Gilbert, George C. Weston, Hiram Chase, J. C. Talbot and S. L. Goodale, their associates and successors, are hereby constituted a corporation for the promotion of fruit culture, by the name of The Maine State Pomological Society.

SEC. 2. Said society shall have all the rights, privileges and powers conferred by the laws of this State upon county and local agricultural societies, and shall be subject to all liabilities imposed by existing laws upon such societies, so far as the same are applicable to the objects of this society; but the bounty to be paid by the State to said society shall not exceed the sum of five hundred dollars* in one year.

SEC. 3. Said society shall have power to elect such officers, and adopt such by-laws and regulations, not inconsistent with the laws of this State, as may be necessary to carry into effect the objects of the society.

*Increased to One Thousand Dollars by Legislature of 1893.

SEC. 4. The first meeting of said society may be called by A. L. Simpson, J. C. Weston and Geo. B. Sawyer, by a notice signed by them, stating the time and place of said meeting, to be published two weeks successively in the Maine Farmer, the last publication to be seven days at least before the time of said meeting.

SEC. 5. This act shall take effect when approved.

(Approved February 17, 1873.)

BY-LAWS

OF THE

MAINE STATE POMOLOGICAL SOCIETY.

AS AMENDED JANUARY 29, 1874.

ARTICLE I.—Membership.

SECTION 1. Any person may become a member of this Society by signifying his wish to do so and paying to the Treasurer the sum of one dollar.

SEC. 2. Any person may become a life member by paying the Treasurer the sum of ten dollars; and the Treasurer's certificate thereof shall entitle such member, with his wife and minor children, to admission to all the exhibitions of the Society.

SEC. 3. Each member (excepting life members) shall pay to the Treasurer an annual fee of one dollar; and the Treasurer's certificate thereof shall entitle him to admission to all the exhibitions of the Society for that year.

SEC. 4. Any member who shall neglect, for the term of two years, to pay his annual assessment, shall cease to be a member of the Society; and the Treasurer shall erase his name from the list of members. Any member may, at will, withdraw from the Society on giving notice to the Treasurer, and paying the amount due from him to the Society.

SEC. 5. Ten members shall constitute a quorum.

ARTICLE II.—Officers.

SECTION 1. The officers of the Society shall consist of a President, two Vice Presidents, Secretary, Corresponding Secretary, Treasurer, and an Executive Committee, consisting of three members exclusive of the President and Secretary, who shall be members *ex-officio,* and one Trustee for each county in the State; all of whom shall be elected by ballot at the annual meetings, and hold their respective offices during the calendar year for which they shall be elected, and until their successors are elected. In the event of a failure to elect the said officers, or any of them, at such meeting, an election shall be held at the next meeting of the Society duly called and holden.

SEC. 2. All the officers shall perform the customary duties of their respective offices, and such further duties as are herein specified or shall from time to time be imposed upon them.

SEC. 3. The Secretary shall keep a true record of the proceedings of the Society and of the Executive Committee, keep an alphabetical list of the members, and make all reports required or authorized by law.

SEC. 4. The Corresponding Secretary shall conduct the correspondence of the Society. He shall open and maintain correspondence with other Pomological and Horticultural Societies for the purpose of effecting an exchange of publications with the same, for the permanent use of this Society; and shall present at each annual meeting, a report, embracing a review of the proceedings of such Societies, and the substance of all such matters therein as he shall deem to be of special interest to this Society.

SEC. 5. The Treasurer shall keep all moneys of the Society and disburse the same only upon the written orders of the Executive Committee. He shall render his accounts annually to the Executive Committee, and give such bond as said Committee may require. He shall keep a record of the names of the members of the Society, and shall from time to time transmit to the Secretary the names of all new members and of such persons as have ceased to be members.

SEC. 6. The Executive Committee shall have the general management and oversight of the affairs of the Society; transact its business, and appoint all standing and special committees, when not otherwise provided for; examine the accounts of the Treasurer, and make an annual report to the Society, of their doings and of the financial affairs of the Society.

SEC. 7. The Trustees shall represent the Society and act as its agents in their respective counties. They may receive applications for membership, and forward the same, with the fees therefor, to the Treasurer, and shall promote the interest of the Society in their respective counties.

SEC. 8. Whenever the office of President shall become vacant, the Vice Presidents shall succeed to his office, in the order of seniority, for the remainder of the year; and any vacancy occurring in any other office may be filled by appointment by the Executive Committee; the person so appointed holding the office for the remainder of the year.

ARTICLE III.—Meetings.

SECTION 1. The Annual Meeting of the Society shall be held at the place and during the time of the Annual Autumn State Exhibition, and such notice thereof shall be given as the Executive Committee shall direct. If, from any cause, the regular Annual Meeting shall not be held as above provided, a special meeting shall be held at Augusta in the month of January next following.

SEC. 2. Special meetings may be called at any time by the Executive Committee; of which meetings each member shall be notified, by a notice properly directed and deposited in some post office at least ten days prior to the time of such meeting.

ARTICLE IV.—Funds.

The fees for life membership shall constitute a permanent fund, to be safely invested by the Treasurer under the direction of the Executive Committee, and of which only the interest shall be used for the disbursements of the Society.

ARTICLE V.—Amendments.

These By-Laws, except Sec. 2 of Article 1, may be altered or amended at any annual meeting of the Society, by the concurrence of two-thirds of the members present, *provided, however,* that Article 4 shall not be so amended without notice given and entered on record at the preceding Annual Meeting.

INDEX TO AGRICULTURAL REPORT.

INDEX TO EXPERIMENT STATION REPORT.

INDEX TO POMOLOGICAL REPORT.

ANALYTICAL SUBJECT-INDEX.

The abbreviation "Sta." signifies the Experiment Station Report, and the abbreviation "Pom." the Pomological Report.