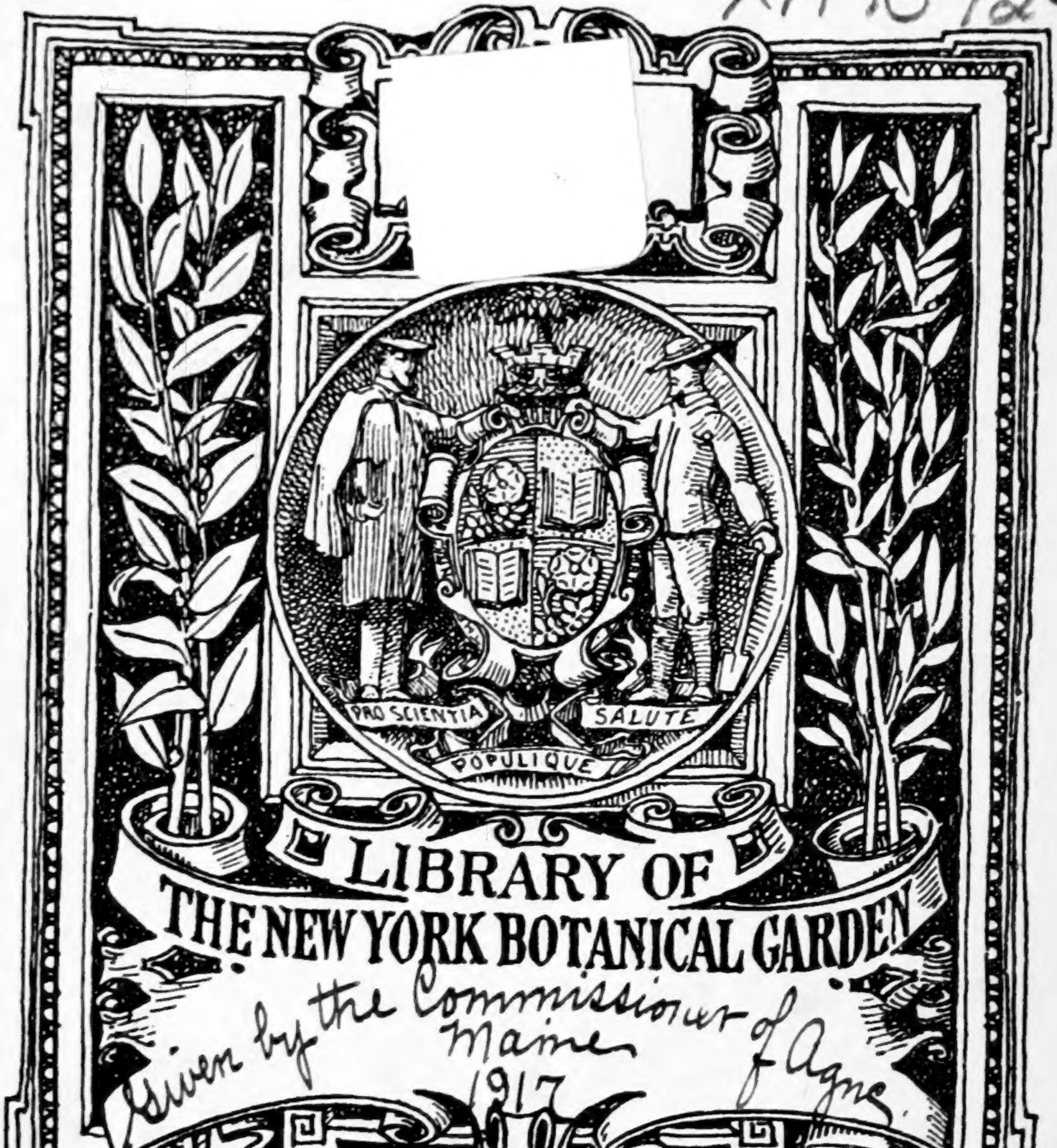
REPORT

OF THE

AGRICULTURAL COMMISSIONER

MAINE 1914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AGRICULTURE OF MAINE

THIRTEENTH ANNUAL REPORT

OF THE

COMMISSIONER OF AGRICULTURE

OF THE

STATE OF MAINE

1914

WATERVILLE
SENTINEL PUBLISHING COMPANY
1915

DEPARTMENT OF AGRICULTURE.

To His Excellency, William T. Haines, Governor of Maine, and Council:

I herewith submit my second annual report as Commissioner of Agriculture of the State of Maine, for the year 1914, in compliance with chapter 204 of the Public Laws of 1901.

JOHN A. ROBERTS, *Commissioner.*

Augusta, December 31, 1914.

MAINE DEPARTMENT OF AGRICULTURE.

JOHN A. ROBERTS, *Commissioner.*

STAFF.

EDWARD E. PHILBROOK, Portland,
Field Agent Gypsy Moth Work.
FRANK S. ADAMS, Bowdoinham, *Dairy Instructor.*
CLARENCE R. LELAND, Mechanic Falls, *Assistant.*
RUSSELL S. SMITH, Auburn, *Dairy Inspector.*
ALBERT K. GARDNER, Augusta, *Horticulturist.*
HERMAN P. SWEETSER, Cumberland Center, *Assistant.*
LEVI S. PENNELL, Portland,
Deputy Sealer Weights and Measures
CLARENCE E. EMBREE, Bangor,
Bureau of Marketing and Supplies
A. M. G. SOULE, Augusta, *Bureau of Inspections.*

CHIEF CLERK.

RENA L. WINSLOW, Augusta.

STENOGRAPHERS AND CLERKS.

EDITH B. WILSON, Augusta.
ANNIE B. GOWER, Augusta.
BERNICE W. WHITE, Augusta.
MRS. ALMA S. BOARDMAN, Augusta.
ERMINA L. SMITH, Augusta.

ANNUAL REPORT OF THE COMMISSIONER OF AGRICULTURE.

In presenting my second annual report, I may say at the outset that harmonious relations have been maintained with all organizations throughout the state. All bureaus in the department have pushed forward the work begun last year and have started new work wherever practicable.

Nearly all crops have been above the average. Prices in some cases have not been satisfactory. The time has come when the farmer needs to pay much more attention to the marketing of his products. He should learn how to combine with his neighbors in this work, as well as in purchasing his supplies.

HAY.

The hay crop of the state was considerably larger than the crop of 1913. The weather was favorable to securing it in good condition. The estimate of the crop is 1,414,000 tons. Most of this is consumed on the farm. While there is some hay exported, it is believed that the imports offset the exports. Too little attention is given to this crop. The average yield, as given by government estimates, is not much in excess of one ton per acre. How much profit can there be in so small a crop? This crop is the basis of all our animal industry. Maine ought to double her hay crop, and by doing so the number of animals on the farms of the state would in all probability be largely increased.

CORN.

The acreage of corn in 1914 was about the same as in 1913, while the yield was somewhat larger. Quite a percentage of the corn raised is put into the silo as winter feed for the stock. Silos have increased in number and in use quite largely in late years. But we think our farmers are not producing enough of this valuable feed. The Maine corn crop ought to be doubled.

The yield of sweet corn for packing was considerably larger than last year. The quality of the corn packed is very high. The price paid by most factories was one-fourth of one cent higher than last year, and reports from some sections indicate that the crop harvested was quite profitable. However, some parts of the state failed of a good crop, due in part to the weather and in part to a lack of an understanding of the conditions necessary to produce a good crop.

SMALL GRAINS.

The acreage of small grains was slightly in excess of that of 1913, and the average yield a very little larger. Oats is the most profitable crop and the harvest reached close to 6,000,000 bushels. The price of all kinds of grain is very high, and we believe farmers should produce more of their grain feed and buy less. Grain as part of a crop rotation can be made profitable, especially if more care is taken to plant the very highest yielding strain of seed and provide better fertilization and cultivation.

POTATOES.

The crop of potatoes in the state equals or exceeds that of 1913. Government estimates place the crop at 32,000,000 bushels and the yield per acre at 260 bushels. This average yield is far in excess of the yield of any other state.

The value of the potato crop is far ahead of that of any other crop except hay. During the last fifteen years the crop has increased by leaps and bounds and is fully 500 per cent larger in 1914 than it was in 1900, when the crop was a little over 6,000,000 bushels. More potatoes are produced now outside of Aroostook county than were produced in the whole state in the earlier year. Many farmers are dropping their other lines of work and devoting all their energies to the production of potatoes. I do not believe such a course to be wise. The crop this year is large throughout the country, especially in those sections that compete with Maine in the market. Potatoes are low in price and much distress is already apparent. It is predicted that many will be unable to realize enough from their crop to meet the demands of fertilizer companies. We say, less potatoes and more hay, corn and grain fed to high class animals, producing milk, cream, butter, cheese, mutton and pork, for which there is always a good demand at fair prices.

ORCHARD CROPS.

Government estimates make the apple crop larger than in 1912, but we do not think this is so. It was, however, very much larger than the crop of 1913. Many orchardists are giving their trees better care, pruning them more, and handling, grading and packing the fruit more in accordance with the demands of the market and so are securing more profitable returns than formerly. At time of harvesting the outlook for a market seemed gloomy indeed, owing to the European war and to the very large crop in the country. In fact, many apples were left on the trees, owners fearing it would not pay to pick them. Dealers, not having definite knowledge of market conditions in Europe, were slow to establish a price and commence shipping. Many apples were bought for $1.00 and $1.25 per barrel. However, it soon appeared that England would take a good many apples, and the price rallied, so that some growers shipping their own fruit realized $2.00 to $2.50 a barrel. Apple growers, as well as potato growers, need larger storage facilities on their farms. Also, farmers should combine and own storage houses near shipping stations. Under pressure of brown-tail moths, tent caterpillars and codling moths, spraying has become a common practice, lessening very largely the percentage of defective apples. Growers are beginning to realize that profit in orcharding is in direct ratio to the intelligent attention given to the business.

VEGETABLES AND SMALL FRUITS.

Again we call attention to the fact that too many of the small fruits and vegetables consumed by our own people are grown outside of the state. There is good money in the raising of these crops if handled understandingly. Taken in connection with a moderate number of hens and a few cows, one can support a family on a few acres of land. How much better off many men in the city, dependent upon others for their daily bread, would be, had they bought a small farm, developed it and made it a source of income that would not fail even in hard times.

SEED AND PLANT IMPROVEMENT.

The work of seed and plant improvement has been in the hands of the Assistant Dairy Instructor, Mr. C. R. Leland, and has been carried along with diligence and enthusiasm. A system of state certification of seeds, including potatoes, has been worked out and put into effective operation during the year. About 45,000 bushels of potatoes have been produced under inspection of the department, as well as a few acres of corn and small grains. Reference is had to the report of Mr. Leland.

GYPSY MOTH.

The Gypsy moth has spread over the whole southern section of the state, being found in nearly 200 towns. The work of destroying this very dangerous insect has been in the hands of Major E. E. Philbrook, who has had the largest experience in such work of any man in the state. Through the planting of parasites and fungous diseases, as well as by the field work of a large crew of skilled men, the numbers have been kept down and in some sections largely decreased. Reference is made to Major Philbrook's report in this volume.

BROWN-TAIL MOTH.

The crop of brown-tails in the fall of 1913 was the largest ever known in the state. Trees were loaded with their nests, and the outlook for handling them was exceedingly discouraging. But the situation was wholly changed at the opening of spring. Parasites, disease and unusually cold weather, working together, wrought great destruction among them. While some few sections have suffered seriously from their depredations this year, most parts of the state have been nearly free from them.

TENT CATERPILLARS.

Tent caterpillars have been very plenty in southern and western parts of the state, and have done much damage to fruit trees, denuding them entirely of their foliage. In many cases trees have been stripped of their leaves for two years in succession and the result is trees wholly or partially dead. It seems unaccountable why one who has paid good money for trees, planted them and cared for them for years until they have reached the age of bearing, should allow them to be killed by an enemy that is so easily and so cheaply destroyed. We have no sympathy for one who sits idly by and allows tent and forest caterpillars to destroy the fruit of his labor. There should be a law whereby such men could be compelled to clean up their trees, or the trees should be cut down and burned.

ARMY WORM.

The army worm made its appearance in late summer, or early autumn, in some sections of the state, especially in York and Sagadahoc counties. Quite a number of fields of grain were badly damaged and in some cases were nearly destroyed.

It is feared that this insect may appear in large numbers and over more extended territory next season.

GRASSHOPPERS.

In two sections of the state, Fryeburg and Lewiston, within limited areas, there appeared in the late summer a great number of grasshoppers. Attempts were made in various ways to destroy them, but without great success, owing partly to a lack of interest among some of the land owners. Just what is the best method of handling this nuisance has not yet been determined in this state.

POWDERY SCAB.

Early in the year powdery scab on potatoes was discovered in Aroostook county. It had been found previously in Canada and had existed for many years in nearly all European countries. Partly on account of this disease, an embargo had been placed on potatoes from Canada and all European countries, by the Federal Horticultural Board at Washington. Owing to this fact, Aroostook growers and dealers were almost thrown into a panic, facing an embargo. As the result of a conference at Houlton, the Governor and Council were asked to take action, which they did by sending a committee to Washington to appear before the Board and ask the withholding of an embargo for the winter and spring of 1914, and the allowing of a system of inspection to be organized and put into effect, whereby all potatoes having the disease or exposed to it would be kept out of interstate commerce. This committee consisted of the Commissioner of Agriculture, J. A. Roberts, Dr. Chas. D. Woods, director of the Experiment Station at Orono, and Hon. W. A. Martin of Houlton. This committee secured the results desired.

Mr. A. K. Gardner, State Horticulturist, was sent to Aroostook county to have charge of the work. About 80 inspectors were employed. To meet the expense of inspection, a fee of $2.00 was placed on each car of potatoes shipped out of the county. The inspection went into operation March 9th, and continued until July 1st. Nearly 10,000 cars of potatoes were shipped. Great credit is due Mr. Gardner for working out satisfactorily a most difficult situation.

On August 1st an embargo on Maine potatoes went into effect, placed there by the Federal Horticultural Board. Congress made an appropriation of $50,000 for inspection, which was taken over by the Board, in whose hands the work has remained to date. Reference is had to Mr. Gardner's report on subsequent pages of this report.

BUREAU OF MARKETS.

The work of this Bureau has been continued during the year, under Mr. C. E. Embree, who has labored unceasingly to educate farmers in better methods of marketing and purchasing supplies and in organizing them so they can work in combination. Full details of the work may be found in Mr. Embree's report, which is contained herein. I hope the incoming legislature will see fit to continue the appropriation. In fact, it ought to be increased so as to employ a second man.

APPLE INSPECTION.

The law providing for grading, packing and branding apples has been carried out so far as this department was able to carry it out with the limited funds at its disposal. Five inspectors have been kept busy during the months of the largest amount of shipping. This number is too small to cover all the state. The work is in large measure educational and great good has already resulted. With a larger appropriation the work can be made more thorough and consequently more satisfactory. Some minor changes in the law are advisable.

WEIGHTS AND MEASURES.

The work in this bureau has been carried on by the Deputy Sealer, Levi S. Pennell, whose work has been highly successful. Nearly all the towns in the state have been brought to conform to the law. For details, reference is had to the report of Mr. Pennell on subsequent pages.

BUREAU OF INSPECTIONS.

In accordance with a statute passed by the legislature in 1913, the execution of the law relating to fertilizers, feeding stuffs, seeds, insecticides, fungicides, drugs and foods was placed in the hands of the Commissioner of Agriculture. By the same law, all work of analysis was placed with the Maine Agricultural Experiment Station at Orono. A. M. G. Soule of Woolwich was appointed chief inspector. He has two stenographers and a corps of inspectors varying in number as the work demands. The work of this bureau is far reaching, touching, in fact, every person in the state. As far as it could be done, the work has been made educational. At the same time, as these laws have been in force some years, long enough to give people opportunity to know of their existence, persistent violators of the law have been brought into court.

Mr. Soule has been very judicious in enforcing the provisions of this most important statute. The difficulties have been many and sometimes embarrassing. The benefits to be derived from such laws are very great and as time passes and people become accustomed to the regulations, the annoyances disappear and the benefits are appreciated.

INSTITUTE WORK.

The appropriation for institutes is $3,000.00. Of this sum $700 is to be used for the annual exhibition of dairy products held under the joint auspices of the Maine Dairymen's Association and the Commissioner of Agriculture. The exhibition this year was held in Bangor and in size and quality was of a high standard. A detailed account of the exhibition will be found in this report.

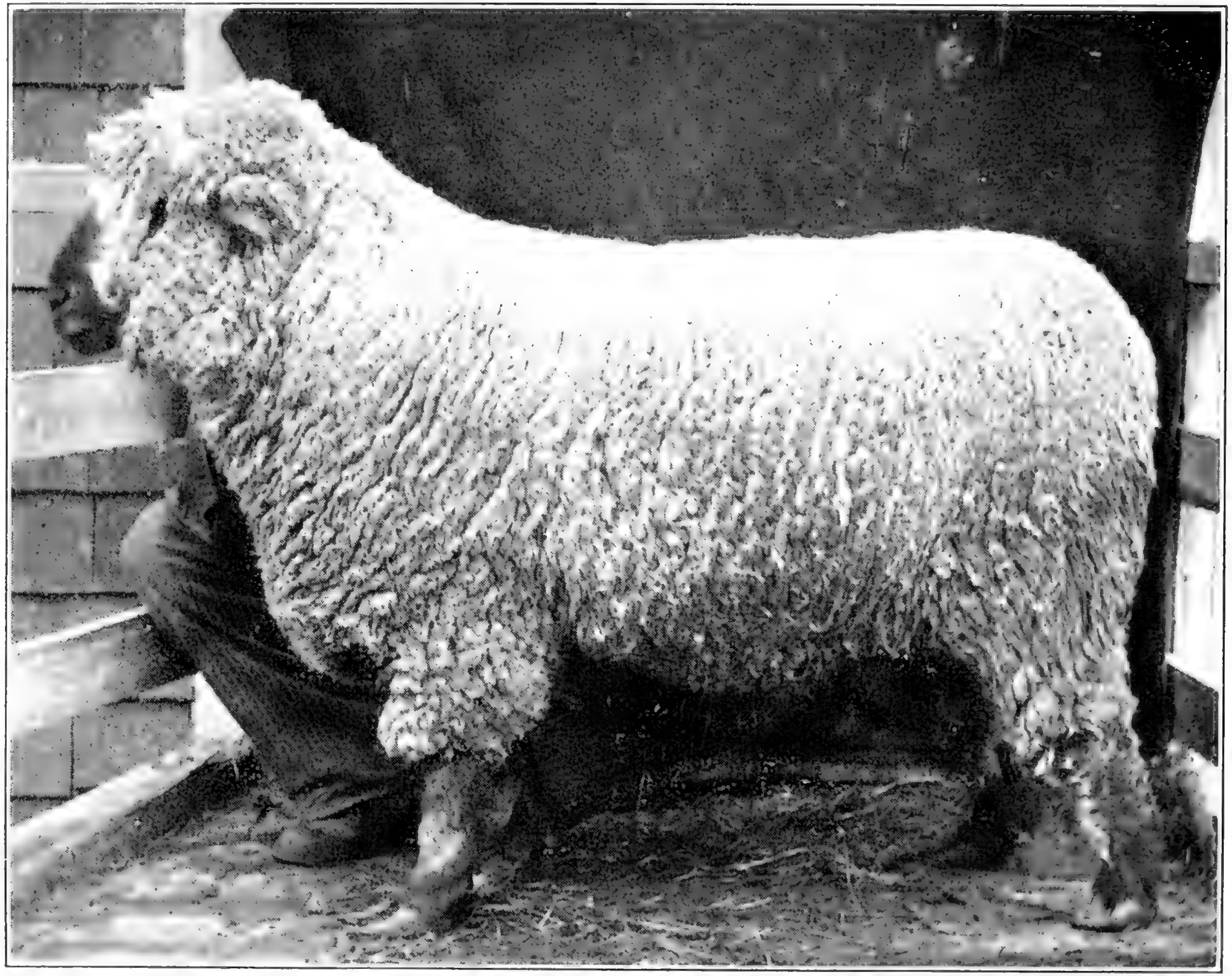
The institute work of the year has been highly successful. A large number of institutes have been held, several of them continuing for two days. The orchard meeting at Auburn, the second one to be held there, was highly successful in every way and left a great impress on fruit growers present, encouraging and enthusing them to better work in their orchards.

A two days' potato meeting was held in Bangor early in the year. Several speakers from out of the state were present, as well as several of our own potato experts. This meeting was followed by seven one-day meetings in Aroostook county. Four of these were in the southern and central parts of the county and three in the extreme north. As a rule, three sessions were held. The attendance at many of these meetings was from 300 to 500 men. Great interest was manifested, due partly, no doubt, to the discovery of powdery scab.

During the late fall meetings were held at Newport, Augusta and Auburn, in connection with the State Grange, the College of Agriculture at Orono, and the Agricultural Committee of the Boston Chamber of Commerce, to secure evidence on the cost of producing a quart of milk. These meetings were well attended. The Chamber of Commerce was to secure information as to the cost of transportation of milk to Boston and also the cost of distribution. The results of the investigation will be published later.

A few speakers at institutes have been brought in from other states, but the larger number have been our own people who have become experts in their several lines of work. It is pleasant to say, and in accord with the fact, that Maine has a large number of agricultural speakers who are the equal of any brought from outside.

A part of the institute appropriation has been used to send speakers to meetings of granges or other organizations. At these meetings the speakers have met larger audiences than at a regular institute, as a rule, and the organization itself has been strengthened. The number of persons attending meetings addressed by our speakers is about 40,000, as shown by records kept.



Lonesome Lad, Hampshire Down, 3 years old.
Owned by W. B. Kendall, Bowdoinham.

THE FAIRS.

The weather during the autumn was unusually fine and most fairs were able to do their best in the way of making exhibits of live stock and farm crops, and securing a good attendance at their annual exhibition. A large volume might be written about the many fairs of the state. We refer readers to what we said in our report for 1913. We wish to emphasize what we said there. We desire to call attention to the fact that the management of many of the fairs is passing out of the hands of farmers, into the hands of village or city men. Farmers should strive to retain the control of all agricultural organizations. We wish to condemn severely the admission of cheap filthy shows upon fair grounds, as well as the multitude of small games of ill repute whose managers resort to every dishonorable device to get hold of the money of inexperienced and unthinking people. We believe the state would do well to make a distinction in the amount of stipend paid to fairs, based on the presence or absence of all such shows and games. The society whose exhibition is absolutely free of such objectionable features is fairly entitled to a greater consideration from the state. We recommend such change in the law as would bring this about. Reference is had to the tables showing the actual work of the various fairs in the state that seek a part of the state stipend.

LIVE STOCK INDUSTRY.

The condition of the live stock industry of the state is practically the same as it was one year ago. Unquestionably there is a constant improvement in the quality of the animals kept upon Maine farms. The various breeders' organizations and dairy test associations are doing much to show farmers the economic importance of keeping only the best. There is no other industry in the state so important as this. Many thousands of our people are dependent upon it for a living. Its increase or decrease in the future will be determined by the fact of whether the crops of hay, corn and small grains produced shall be increased or diminished. Again we feel it our duty to advise farmers to raise fewer potatoes and more hay, corn and grain. The work of this department devoted to the improvement of our live stock interests has been in the hands of Mr. F. S. Adams, whose practical as well as scientific knowledge has enabled him to make his work successful.

The work of dairy inspection was in the hands of Mr. Russell S. Smith up to October, when he retired to accept a position in the Dairy Division at Washington. Mr. Smith was always zealous in the work of raising the standard of Maine dairy products. His departure was a distinct loss to the department and the state. On his retirement the work of dairy inspection was placed in the hands of Mr. A. M. G. Soule, in connection with the inspection of other foods. Reference is had to the reports of Mr. Adams and Mr. Smith.

HORTICULTURE.

The fruit interests of the state are yearly assuming increased importance. No state in our broad country can surpass or equal Maine in the quality of her orchard products. We have many thousand acres of hill country that are especially adapted to the production of the finest apples that grow. It is gratifying to note that our orchardists are recognizing this fact and are working to place the orchard business of the state on a business basis. In this connection we wish to recognize the great work the Maine Pomological Society is doing. Its annual exhibition this year, held in the City Hall, Bangor, greatly surpassed all former exhibitions, both in quantity and quality of fruit shown. The work in this department has been under the State Horticulturist, Mr. A. K. Gardner, and his assistant, Mr. H. P. Sweetser. Their efforts have been untiring and we believe they have given universal satisfaction to the fruit growers of the state. Reference is had to their report, to the report of the great meeting held in Auburn and to the transactions of the Pomological Society.

PEST ACT.

The unexpected discovery of powdery scab in Aroostook county, the sudden appearance of the army worm and other insects, pests and diseases destructive to vegetation indicate strongly the need of legislation designed to prevent, control and exterminate such insects, pests and diseases. We suggest the advisability of creating a commission to have jurisdiction over such work, with authority to recommend rules and regulations to the Commissioner of Agriculture, who would be the executive officer of the commission. Such commission might be made up of three men in the department and, joined with them, the entomologist and the plant pathologist of the Maine Agricultural Experiment Station. The jurisdiction of this commission would include the gypsy moth, the brown-tail, and all other insects, pests and diseases destructive to vegetation. A conference has already been held in the department to consider the matter and by its direction a rough draft of an Act has been made by Mr. Gardner.

PUBLICATIONS.

Quarterly Bulletins have been published by the State Dairy Inspector, Russell S. Smith, on the work of his bureau; a bulletin on Better Crops, by C. R. Leland, Assistant Dairy Instructor; a bulletin on Dairy Feeds and Records, by F. S. Adams, State Dairy Instructor; a bulletin on Strawberry Culture under Maine Conditions, by A. K. Gardner and H. P. Sweetser; a bulletin on Trip to National Dairy Show by F. S. Adams and E. E. Philbrook; Report of Gregory Orchards for the Fourth Year and Gregory Orchard Circular No. 2, by A. K. Gardner; a Catalogue of Farms for Sale in Maine, and the report of the Commissioner of Agriculture, Hon. J. A. Roberts, for the year 1913.

GROWTH OF THE DEPARTMENT.

At the time of the creation of the office of Commissioner of Agriculture, in 1901, the duties of the position were confined mostly to institute work and visiting fairs. Soon after that there was established in the department a Dairy Division for the improvement of dairy products, the official head being known as Dairy Instructor. A system of dairy inspection was provided and placed in the hands of a State Dairy Inspector. Later a Bureau of Horticulture was established, the head of which was known as the State Horticulturist, and he was provided with an assistant. The spread of the brown-tail and gypsy moths in the state led to the creation of the office of Field

Agent for Moth Work. The demand for the improvement of seeds and plants led to the establishment of the office of Field Agent for Seed and Plant Improvement, a work now in charge of the Assistant Dairy Instructor. The work of state certification of seeds introduced this year requires the employment of half a dozen men as inspectors for a period of several weeks.

The law of 1911 made the Commissioner of Agriculture the State Sealer of Weights and Measures, and this work was placed in charge of a Deputy Sealer.

The legislature of 1913 made an appropriation to study market conditions, which led to the establishment of the Bureau of Marketing and Purchasing Supplies. In the same year the legislature placed the execution of the law for grading, packing and branding apples with the Commissioner. This required the employment of five inspectors during the shipping season. The same legislature placed in this department the execution of the laws demanding the inspection of fertilizers, feeds, seeds, insecticides, fungicides, drugs and foods. The Bureau of Inspections was organized, with a Chief Inspector at its head, and under him several deputies.

Thus is briefly outlined the growth of the department in late years. The department should be removed from political influence as far as possible. We recommend that the term of the Commissioner be made six years instead of two years.

We wish to acknowledge here the hearty support given our work by the Governor and Council, the State Grange, the Pomona and subordinate granges, the College of Agriculture, the Experiment Station, the press of the state, the various boards of trade and chambers of commerce, the Dairymen's Association, the Pomological Society, and various other farm organizations. In fact, all the people of the state have coöperated whenever opportunity offered.

I am deeply indebted to all the members of my staff, clerks and stenographers, for their cheerful, faithful and loyal work.

REPORT OF STATE DAIRY INSTRUCTOR.

To Hon. J. A. Roberts, Commissioner of Agriculture:

I respectfully submit my report as Dairy Instructor for the year 1914. There has never been a time when the dairy interests of this part of the country were as well brought before the people as now. Granges, farmers' clubs, dairy associations, chambers of commerce and even bankers, are interested in the milk producers. There seems to be a change of heart in the average New England banker. He is beginning to realize that it would be unfortunate to have milk and cream brought in from Canada to supply Boston and other New England cities. Money going to Canada in payment for milk would seldom, if ever, get back into American banks. The banker is beginning to believe that a prosperous farming country brings prosperity to the cities.

In this report I am speaking of the milk and cream situation in the New England states, for these states are not so much interested in the butter situation. In the near future it will take all the dairy products of these states to furnish market milk and cream, as the future supply of Boston and the other cities of Massachusetts must come from the states of Vermont, New Hampshire and Maine. Rhode Island and Connecticut cannot supply their own cities. In fact, the state of Maine is sending cream to Rhode Island and Connecticut and no doubt the market could be increased if we had the goods. In order to meet the increased demand there will have to be an increase of dairy cows instead of the decrease that has taken place the last decade.

I have just noticed by the report of the State Assessors for 1914, which is a report of conditions as they existed April 1, 1914, that the number is still decreasing. The following tables show the increase in the values and the decrease in the number of cows:

Value of live stock, 1914	$17,691,690
Value of live stock, 1913	17,220,619
Increase	471,071
Number of cows, 1914	130,661
Number of cows, 1913	135,088
Decrease	4,427

This same report does not show very much change in the young stock. There must be some specific reasons for the decrease, which is more marked in some of the New England states than Maine, especially Vermont. Perhaps one reason is the high price of live stock, especially veal calves. In many instances a good veal calf will sell for more than the same animal when one year old. And the high price of cows is quite an inducement to sell, when a good grade cow will bring one hundred dollars and sometimes more. Last year over 5,000 milch cows were sold and shipped to Massachusetts. Also, other branches of farming have in some sections crowded out the dairy cow, especially potato growing outside of Aroostook county. But I do not think these reasons are the real cause for the decrease in dairy cows. I think the real trouble is that dairying is not an attractive business for the young man nor the hired man. They do not like to be confined to milking and caring for cows twice a day three hundred and sixty-five days in the year. For this reason, if for no other, it should pay a good profit, which is not the case. The Boston Chamber of Commerce is now investigating the entire milk situation in the New England states. I had the pleasure of attending a meeting of the Boston Chamber of Commerce in Boston last July and the matter of an investigation was under discussion. At this meeting there were representatives from the colleges of agriculture, departments of agriculture, state granges, and other agricultural associations from all the New England states. The whole subject was thoroughly discussed and it seemed to be the unanimous opinion of those present that the milk producers were not getting enough for their products, and all expressed a desire that the Chamber of Commerce should make an investigation of the entire situation, from the producer to the consumer. The Chamber of Commerce was frank to say that they were going into this matter from a purely business standpoint, for, as one of the members of the Chamber said, when the farmer is prosperous he spends his money with the local merchant and this merchant buys supplies from Boston. In other words, unless the farmers are prosperous, the cities do not receive their full measure of prosperity. At the present time they are only partly through with their investigation.

In order to get at the cost of production, three meetings were held last fall, in all the New England states. The meetings in this state were held at Newport, November 11, Augusta, November 12, and Auburn, November 13. These meetings were advertised and all the local arrangements made by the State Department of Agriculture. They were in charge of Mr. John C. Orcutt, secretary of the committee on agriculture of the Chamber of Commerce. Mr. Lyon Weyburn, the counsel for the committee, conducted the hearings. The meeting at Auburn was the largest, 67 being present, 42 of whom were milk producers, representing the following cities and towns: Auburn, Bath, Camden, Falmouth, Greene, Hollis, Lewiston, Lisbon, Mechanic Falls, New Gloucester, Norway, Sanford, Turner, Waterford, Westbrook, Winthrop, Woodstock.

Some of the best dairymen in the state were present and the following is taken from the testimony of one of them.

Average production of cows, 6,700 pounds, or 388 cans, sold to Hood and Son at 33 1-3 cents per can....		$129.98
Paid for grain	$38.87	
Labor at 10c a day...................	36.50	
Depreciation	15.00	90.37
		$39.61

This leaves $39.61 for hay, ensilage and pasture, not taking into account keep of bull, taxes, insurance, bedding, ice and other incidental expenses. Setting these items against the manure there is still $39.61 left for hay and ensilage. In reckoning the labor, the dairyman estimated his own time at the same price he paid his hired man, charging nothing for his services as manager, or for the care and worry to increase or to hold the average production of his herd, the trouble that he is likely to have with diseases, and the many other things that a man has to contend with in handling a dairy herd, which is the kind of work that brings a high price in the labor market. Nothing was said about the labor of the farmer's wife in washing and caring for the separator and other dairy utensils every day in the year.

The trouble with many of us farmers in the past has been that in reckoning the profits on the farm we have been inclined to the idea that our own work should not be charged in the expense of production, and this is especially true in the case of the good housewife. If the dairyman cares for his cows in a business and efficient way, he is entitled to pay for his services as a business man, and there should be enough profit to pay for the services rendered by his wife also.

All the testimony at these meetings seemed to show that the dairy farmers were working hard in the summer, raising a large amount of roughage on their farms and selling it to their cows. Provided they had cows of high average production, they were getting a fair market price for these farm crops, by charging their own labor at the same rate as the hired man's labor. Now in order to remedy these conditions and give the dairy business a boom, there must be some means devised for cheaper and more efficient methods of transportation and distribution, or the consumer must pay more. I hope the first method may be worked out.

Whole milk is by all odds the cheapest food on the market, and would be if the consumer paid ten or twelve cents per quart, but anything that raises the price of a product has a tendency to decrease the consumption and it would be a great misfortune for the consumption of milk to be decreased. We would rather educate the public to use more milk, as good milk is always a healthful and cheap article of food.

The evidence brought out at these meetings showed a wide range of cost as follows:

Cost of feed	$60.00	to	$80.00
Cost of labor	30.00	to	37.00
Cost of bedding	5.00	to	7.00
Keep of bull, per cow	2.00	to	3.00
Interest on money invested in cows	3.00	to	4.00
Taxes on cows and barn	1.25	to	2.00
Barn rent	1.50	to	2.00
Insurance, per cow	.40	to	.75
Medicine, salt, tools, utensils, etc.	1.25	to	2.00
Depreciation	7.50	to	15.00
	111.90	to	152.75

CREDIT.

Manure	$15.00	to	$20.00			
Calf	2.00	to	5.00	$17.00	to	$25.00
				94.90	to	127.75

With the exception of the feed, these items were largely estimated. The evidence showed that the cows in these herds were producing from 5,000 to 7,000 pounds of milk per year, or from 2325 to 3255 quarts, at a cost of from four to five cents per quart. This is the cost at the farm and leaves nothing against transportation to the creameries or other markets, the cost of which it is almost impossible to estimate.

I am in hopes that when the Boston Chamber of Commerce get through their investigation, ways and means will be devised for cheaper and more efficient methods of transportation and distribution. In the meantime we dairymen must work all the time for more efficient methods in our work of production, improving our herds to a high degree of production and raising all the feeds possible on our farms.

It may seem that what I have said is discouraging to the dairy interests of Maine; but in spite of all that, I still believe dairying to be the best and safest branch of farming. The dairy business gives employment every day in the year. The different forage crops that are raised on a dairy farm give a long season of sowing and planting in the spring, and an equally long season in harvesting. It means a rotation of crops, which is essential to the most successful farming. There is no branch of farming that will so quickly and successfully increase the fertility of the soil, and this conservation of the fertility seems to be the most important thing that confronts the State of Maine farmers. The market for dairy products does not fluctuate so much as the market for other farm crops, and this gives a most certain source of income. The feed given a dairy cow is returned to the owner tomorrow and can be marketed at once. Good dairy cows will return more human food from a given amount of farm products than any other animal. Prof. Henry says that for each unit of food consumed the dairy cow will return six times as much food material as either the steer or the sheep. She is, then, our most efficient farm animal and will remain after other animals have disappeared, except pigs and hens, which can be fed on refuse. More economic management from the soil to the marketing of the products must be studied in order to decrease the cost to the minimum. Many are the problems that must be solved.

The breeders of dairy cattle in the United States have demonstrated to the world their superiority, by breeding, feeding and developing the World's Champion cow of every breed. As a result of this we are today exporting hundreds of dairy cows at high prices to Japan, Argentine Republic and other countries. What the dairyman in Maine needs is more coöperation in cow test associations and community breeding associations. The report of the last International Dairying Congress states that many of the best associations in the old countries have increased the production of their herds 40 per cent. Sweden has 700 cow test associations, Denmark 500.

The next step following cow test associations is community breeding, which brings a full measure of success to dairy farmers. There are some very successful associations of this kind in the western states, especially the Guernsey Breeders' Association in Wisconsin. The sales of this association amount to nearly three hundred thousand dollars in one year, buyers coming from foreign countries.

I think we have reason to congratulate ourselves on the health of our cattle in Maine. A very small percentage of our cattle are affected with tuberculosis and this is going to mean a good deal to the live stock breeders of the future. Tuberculosis in the human family is being studied and means of prevention devised with an energy never dreamed of before. Every favorable avenue of infection will in the future be a target for physicians and scientists.

Perhaps it would be well to make a brief review of the work the past year. We have been working all through the year to stimulate and encourage cow test associations. Mr. A. M. Goodman of the United States Dairy Bureau was in the state from April 14 to April 25. Meetings were held in Readfield, Waterville, Hiram, Troy, Freedom, Charleston, Auburn and Waterford. As a result of these meetings a cow test association was formed in Hiram which has now 28 members. Mr. Harold Straw is the official tester, and it is an active and wide awake association. Mr. Hugh Fergus of the Dairy Bureau at Washington will be in the state early in 1915, and it is expected that several new associations will be organized, as much interest in this work is being manifested in many sections of the state. In the successful management of these associations it is hard to find men for official testers and to hold them for a year. If this work is to continue and give a full measure of success it seems as though the College of Agriculture would have a special concern in this work. We now have five active associations. There are two dormant, those at Winthrop and Monmouth. I think that these associations can be reorganized, and an attempt to do this will be made early next year. An association was started in Piscataquis county last July. After three months the tester left and the principal of Foxcroft Academy thought the association could be managed by the agricultural class in the academy. While this may work out all right with a few lectures near by, for educational purposes, it is not practicable for the students to do the work required by an association of this kind. This was demonstrated last year at Freedom Academy. The cow test associations whose members take an interest in their regular meetings are the ones that are doing the best work. Speakers are furnished at these meetings by the Department of Agriculture and the College of Agriculture, without any expense to the association, and in the summer meetings are often held at the farms of some of the members.

In closing this discussion of cow test associations I want to emphasize what I said last year. They are the best associations for more efficient dairying of any we know about. I also believe that more attention should be given to breeders' associations. We now have fourteen in this state. In some of these associations there seems to be a lack of interest on the part of the members. It is a true saying that no association or organization can help its members unless they try to help themselves. The possibilities of breeders' associations are almost unlimited, in organizing community associations and coöperating in advertising and selling stock.

During the year I have attended twenty-one grange meetings, seventeen dairy institutes, eighteen farmers' institutes, twenty cow test association meetings and twelve breeders' meetings, a total of eighty-eight meetings, with a total attendance of 6,947 and an average attendance at each meeting of 80.

The annual meeting of the Maine Dairymen's Association was held in Bangor in connection with the annual meeting of the Seed Improvement Association. This was one of the most successful meetings ever held in the state. A detailed report will be found in the report of the Maine Dairymen's Association and Maine Seed Improvement Association for 1914. These union meetings are very successful and I hope that next year the Maine State Breeders' Association will unite with these other two associations in holding their annual meeting.

Respectfully submitted,

F. S. ADAMS,

State Dairy Instructor.

REPORT OF ASSISTANT DAIRY INSTRUCTOR.

To Hon. J. A. Roberts, Commissioner of Agriculture:

It is with much pleasure that I submit to you this report of work done under my direction the past year, leading to seed and crop improvement in Maine. There is no one improvement in our agricultural methods which will give us at once results so financially attractive and so conducive to personal satisfaction as seed and crop improvement.

How much more pleasant it is to grow a crop which is uniform as to variety, which is free from disease and weak plants, and which gives us a large yield, than to grow crops made up of mixed varieties or strains, and crops of which the yield has been reduced by disease or hereditary weaknesses of the plant.

A rapidly spreading interest has been noted the past year in the slogan which has been our motto, "Better Seeds for Maine." We have at all times kept this motto in mind and have urged its importance by means of the press, lectures at institutes and grange halls, by correspondence, and by personal conversation while in the field.

Holding as I have the position of secretary of the Maine Seed Improvement Association, close coöperation has been maintained between this division of your department and the association, to the mutual advantage of both. Short mention of this association may not be out of place in this report. The Maine Seed Improvement Association was organized January 25, 1910, with the following Declaration of Purposes:

"It is the purpose of this association to promote the agricultural interests of the state:

1st. By establishing more cordial relations between the farmers of the state, thus enabling them to act unitedly for the betterment of rural pursuits.

2nd. By carrying on such investigations and experiments, and by growing and disseminating such new and superior varieties of farm seeds and plants as shall be of benefit to all parties interested in progressive agriculture.

3rd. By distributing literature bearing upon the work of the association and other agricultural investigations.

4th. By holding an annual meeting for the discussion of topics and experiments beneficial to the members."

This association is becoming a power for agricultural betterment in the state and should be recognized as such and given every assistance and opportunity for development, by the Department of Agriculture.

One of the most important steps taken the past year has been the successful installation of a system of seed certification. The need of such a plan has been recognized for several years by men familiar with the difficulties concurrent with the production and marketing of first quality seed stocks. The need of a system of inspection, under the supervision of the proper authorities, leading to certification, or a guarantee of purity as to variety, freedom from disease and ability to produce a large yield, particularly of potatoes, was focussed and brought strongly to the attention of both seed producers and seed buyers, by the discovery of the presence of powdery scab in Aroostook county early in the year. With the aid of members of your department and of the United States Department, the Director and Pathologist of the Experiment Station, the executive committee of the Maine Seed Improvement Association, and prominent potato growers in the state, a plan was formulated whereby a joint guarantee of the merits of the seed was to be made by the association and by your department. A statement was made through the press giving an outline of the plan, and the necessity for its adoption, and the certification standard which had been approved by the committee. A rather complete outline of the plan follows:

POTATO INSPECTION STANDARD.

There shall be three inspections during the season:

The first, during the time of bloom; the second, as late as possible before harvest; the third, between harvest and shipment.

View on Aroostook Farm of Maine Agricultural Experiment Station, Presque Isle.

First Inspection.

It shall be required that all seed planted in the seed fields shall be treated with formaldehyde solution or corrosive sublimate solution, to prevent blackleg and common scab. In addition it is recommended that cut seed be rolled in sulphur.

Blackleg: More than 80 hills per acre will disqualify.

Varietal Mixtures: More than 240 hills per acre will disqualify.

Weak Plants, including Curly Dwarf, Mosaic, Wilt, etc.: More than 500 hills per acre disqualifies.

Leaf Roll: A single specimen disqualifies.

Second Inspection.

Time, prior to harvest, while foliage is still green.

Blackleg: More than 16 hills per acre disqualifies.

Leaf Roll: One specimen disqualifies.

Varietal Mixtures: More than 80 hills per acre disqualifies.

Weak Hills: 100 hills per acre shall be dug for sample. Five per cent producing conspicuously less than average yield will disqualify. (In case of doubt, check result).

Powdery Scab: A single specimen disqualifies.

Wilt, including such diseases as Mosaic and Curly Dwarf: More than 160 hills disqualifies.

Late Blight: Amount shall be reported by inspectors, that it may be entered upon certificate.

Third Inspection.

Time, at or before awarding of certificates.

Any Powdery Scab causes rejection. Certificates shall state percentage of trueness to type or purity.

The grower shall agree to remove all decayed and badly damaged tubers before shipment, and to remove from seed stock all potatoes badly infected with sclerotis and common scab.

No seed stock shall be sold containing tubers of less than three ounces or more than ten ounces, and four to eight ounces is recommended as the size most satisfactory.

Growers were invited to enter their fields, paying a small entry fee, varying from $1.00 down to 60 cents per acre, according to the number of acres entered. The growers were asked to fill out and return to the office the following blank:

POTATO CERTIFICATION REPORT BLANK.

Acreage entered for certification inspection ....
Variety ....
(If more than one variety give acreage of each)
Was all seed entered under this certification plan treated for blackleg and common scab:
By formaldehyde? ....
By corrosive sublimate? ....
Did you use sulphur upon seed after disinfection? ....
How much varietal mixture appeared in seed? ....
Date planted ....
Kind of soil ....
(As sandy loam, clay loam, alluvial soil, etc.)
Was Rhizoctonia present upon seed? ....
How much? ....How bad? ....
Was common scab present? ....
Were badly infested tubers planted?................................
Was any powdery scab present in seed?..............................
Did seed come in contact with any tubers, bins or racks infested with powdery scab? ....
Did tubers show any blackening of interior when cut? ....
If so, were these tubers thrown out? ....
How much dry rot or late blight was present in seed? ....
Were these thrown out? ....

If possible answer following questions:
What did these potatoes yield last season?
Was yield uniform? ....
Upon what kind of soil were they grown? ....
How much disease was found in last year's crop? ....
Has seed come evenly every year?
If not, why? ....
Do you wish blanks for keeping cost? ....
Name ....
Town .... Address ....
Best way to reach farm ....

At the time of the first and second inspections the following blanks were filled out by the inspectors:

First Inspection.

Name of the grower ....
Address .... Town ....
Varieties and acreage of each ....
General appearance of fields ....
Blackleg; note number of hills found in each variety ....
Varietal Mixtures; note each hill which is noticeably of different variety
....

Weak Plants; note number found in each variety, including Curly Dwarf, Mosaic and Wilt ....
Leaf Roll; if found, note its appearance ....
Does grower agree to follow inspector's recommendation in regard to caring for weak plants and varietal mixtures? ....

In case of doubt send samples to Dr. W. J. Morse, plant pathologist, Maine Experiment Station, Orono.

Date ....

Inspector.

Second Inspection.

Name of the grower ....
Address .... Town ....
Varieties, and acreage of each ....
General appearance of fields ....
Number plants of other varieties ....
Number of blackleg hills ....
Number of Rhizoctonia hills ....
Number of weak plants, including Curly Dwarf, Mosaic, Wilt, etc......
Number of plants of leaf roll ....
Is late blight prevalent in fields? ....
Is yield uniform in each variety? ....
(Note. Dig sufficient hills on each field to get average)
Approximate average weight of tubers in hill, each variety ....
Are tubers smooth, uniform and of good shape, each variety? ....
Probable percentage of common scab ....
Notes of interest ....

Date ....

Inspector.

August 1st we began field work with the following inspectors: Blynne Allen of Norway, H. P. Adams of Bowdoinham, E. L. Newdick of Sanford, E. F. Grenier of Augusta, and C. A. Day of Machias. Mr. Day was to do only such work as appeared in Washington county. All of the inspectors received special preparation for their work at the Maine Agricultural Experiment Station. From August 1 to September 21 these men were engaged in inspecting and roguing the diseased and mixed plants from the 679 acres of potatoes entered by 68 farmers scattered generally over the state. 222 acres were safely above the standard set, and the potatoes from the fields are being sold under a tag bearing the statement on one side that "The crop was inspected and found to be true to type and free from disease by the Maine Department of Agriculture," and signed by the Commissioner of Agriculture. On the reverse side is the signed statement of the grower that "The seed in this package is from fields inspected and passed by the Maine Department of Agriculture." The tag is also signed by the inspector making the third and final inspection of the seed. This final inspection has been put in the hands of the Federal authorities in charge of the powdery scab regulations and inspections. The average increased price for sales of certified seed over ordinary seed stocks has so far been between 10 and 20 cents per bushel.

It should be a source of satisfaction to seed growers of Maine to know that only one other state so far has ever taken up certification work. Wisconsin has this year inspected and certified 35,000 bushels of potatoes, while Maine has certified 45,000. We have also inspected 100 acres of grain, and about 4,500 bushels of oats may be recommended as especially valuable for seed purposes.

The week of August 1st it was my pleasure to spend in a tour of the potato sections of Aroostook county as your representative to the party composed of potato experts and pathologists from the Federal Department of Agriculture, from Virginia, New Jersey, New York, Massachusetts, Vermont, and the Maine Experiment Station. The most noted guests were Geheimrath Dr. Otto Appel of Germany, one of the leading experts of the world on potato diseases, and Dr. Güssow, the Dominion Botanist of Canada, who was the first to discover powdery scab on the American Continent.

The party was entertained royally by the potato growers of Aroostook. The trip, which was planned to take in all the large potato sections in the United States, was for the purpose of studying conditions of culture, disease and methods of handling, that the federal and state departments might better advise the potato growers of the nation as to improvement in methods of culture, handling and combatting disease. Dr. Appel stated that conditions for potato growing were wonderful in Aroostook, but that the growers should use greater care in their seed or he could foretell a reduction in the yield and in percentage of marketable tubers. He particularly warned of the danger from Rhizoctonia, until within a few years a disease unknown in Maine but already infesting nearly every field to a greater or less extent.

Early in the spring, upon request of M. L. Wilson, assistant in the department of agronomy of the Montana Agricultural College and Experiment Station, we sent to Montana six lots of Maine flint corn for test in comparison with their own corns. Upon a recent date Mr. Wilson writes that while the data have not yet been compiled, results were very satisfactory. He states the following: "I will say, however, that the corn which you sent us did remarkably well and I rather think that one or two varieties will stand close to the head of our list. One of these corns, as I remember, came from the town of Cumberland. I rather think that one or two of your varieties stand a good chance of being widely grown, and it may be that we will want to secure more seed next year. We included in our variety tests this year 236 different varieties and grew about 20 different Indian corns besides. Our results usually show that our native northwestern corns excel any which we can import."

In May we were asked by the Union Trust Company of Ellsworth to assist them in placing for test and in securing data upon the growth and development of corn from 90 ears of Minnesota White Cap dent corn. The following circular letter was mailed to patrons of the Trust Company and 86 ears of corn put out to farmers of Hancock county.

"Union Trust Company Coöperative Corn Experiments:

"By the courtesy of friends a supply of hardy dent corn has been sent us from Minnesota to be tried by the farmers of Hancock county with the hope that a strain of dent corn may be developed which will be of value to the State of Maine.

"It should be understood that this corn has been grown in a soil which is different from our own and in a different climate, and that it will be necessary to give the corn every assistance in the way of preparation of the soil, fertilization, cultivation and care. It is also desired to keep a record of the experiments and the results received by the men testing this corn in coöperative experiment with the Union Trust Company.

"The Department of Agriculture is coöperating with the Trust Company and is ready to give the farmers of Hancock county every possible assistance not only in the corn experiment but in other farm matters as well."

It being the desire of this Department and of the Trust Company to give the growers every assistance possible, we made out a list of suggestions covering in a general way the best methods of growing the crop. We also asked each grower to keep a record of the crop and report to the Department upon blanks furnished by us. We hoped in this way to learn something of the value of this corn for the State of Maine. Twelve men have reported so far. Of these 9 have corn fit for planting; 3 report failure; 3 are doubtful as to its value and 6 believe by proper selection and breeding the variety may be made valuable. It is unfortunate that such a small part of the 86 farmers planting this corn have reported upon the advisability of continuing the test. It is by no means a settled question whether a larger yield may be secured from dent varieties over our native flints. Careful, systematic variety tests should be made under varying soil and climatic conditions of the state; comparing growing cost, length of time required for maturing, yield and food value of the crop.

The suggestions for growing and record blank asked of the farmers testing corn in Hancock county follow:

SUGGESTIONS.

1. Plow deep.

2. Harrow thoroughly.

3. Manure well, plowing under if possible.

4. Do not plant until the soil is warm and mellow, but the earlier the corn is planted the better.

5. Do not plant too close together. Remember the corn is a large variety and new to our soil. Three stalks every 3 feet is sufficiently near.

6. Be careful in planting. Do not allow the seed to be placed too close to a large amount of commercial fertilizer. It is better to use a small amount under the plant and apply the balance when the plant is six inches to one foot in height.

7. Keep down the weeds. Weeds take not only plant food which belongs to the corn, but more serious still, they draw a large amount of water from the soil.

8. Till thoroughly to make and keep dust mulch. Water evaporates rapidly from hard soils. A mulch prevents evaporation.

9. Remove weak plants and plants which bear no ears. They will be valuable for fodder but if left will take moisture

and fertility which otherwise would be available for the ear-producing plants.

10. In harvesting, the corn will mature better on the stalk or in the shock than if broken off and traced up. This rule depends somewhat upon the time in which the corn will mature and the weather.

11. Save the best ears from the best stalks in the best hills for seed next season. He is a wise husbandman who heeds the admonition to "Save a portion of the best for seed."

12. Care carefully for the seed. Remember severe cold or extreme heat or excessive moisture will injure the vitality of the seed.

RECORD BLANK.

Report of Cooperative Corn Experiment between Union Trust Company of Ellsworth, the State Department of Agriculture, and the farmers of Hancock county.

Please answer all questions fully. The value of the report will be according to the accuracy of answered questions.

Is this corn planted upon high or low land? ....
Wet or dry land? ....What kind of soil? ....
What crops were produced on this soil in the past 3 years..............
1913 .... 1912 .... 1911 ....
When plowed? ....
How fertilized? Explain fully ....
....
When was corn planted?...
How many hills of 3 stalks each? ....
When did first tassels appear? ....
When did first silk appear? ....
What date harvested? ....
Total weight of corn when husked and dry...............................
Weight of corn suitable for seed ....
What was height of stalks? ....
Did stalks produce more than one ear? ....
Is this corn a valuable variety for Maine conditions? Please write fully ....
Dated .... Signed ....

The first corn contest of the Norway National Bank was a new departure in Maine banking circles and was brought about by a realization of the tremendous amount of money paid out monthly by this bank in taking up drafts for western grains.

On April 30 the following circular was mailed to the rural patrons of the bank and was published in the local paper.

First Corn Contest of the Norway National Bank, Norway, Maine.

To stimulate further interest among the farmers in raising yellow corn this bank has concluded to offer prizes for the best five ears of yellow flint corn raised from one-half acre of land during the season of 1914. Any Oxford county and towns of Otisfield and Harrison farmer—man, woman, boy or girl—can compete.

Entries in this contest will close promptly at 6 o'clock P. M., June 6th. Blanks for entering may be obtained at the Norway National Bank either in person or by writing for them.

The corn will be judged on a date to be announced later, by a judge selected by the State Commissioner of Agriculture, and a Corn Field Day will be held by the Department of Agriculture at Norway on the same day.

PRIZES.

First prize	$10.00 in money.
Second prize	8.00 in money.
Third prize	6.00 in money.
Fourth prize	4.00 in money.
Fifth prize	2.00 in money.

Write now for entry blank, score card and circular which gives more information about the contest.

THE NORWAY NATIONAL BANK,
Norway, Maine.

April 30, 1914.

On November 21st Corn Day was conducted at Norway, at which time corn and other crop husbandry were the topics.

Owing to frost, only three lots of corn were sent in by competitors, but many members of the grange brought in flint and sweet corn and potatoes, making a very nice exhibit.

Professor G. E. Simmons of the University of Maine scored the corn according to the score card made up by the bank officials.

SCORE CARD.

		Standard	Score
1.	Adaptability	25	
2.	Seed condition	15	
3.	Shape of kernel	15	
4.	Uniformity and trueness to type	15	
5.	Weight of ear	10	
6.	Length and proportion	10	
7.	Color of grain and cob	5	
8.	Butts and tips	5	
	Total	100	

I believe such contests as these inaugurated by the Norway National Bank of Norway and by the Union Trust Company of Ellsworth, cannot fail to be of benefit to the farmers. I hope these banks will continue similar efforts and that others may join with them. A substantial increase in the amount of our corn and grain crops will reduce the amount of money we are annually sending west.

The additional feed we might easily grow would allow us to increase our stock and thus add to the fertility of our farms, without increased expense for commercial fertilizers. This means greater and mutual prosperity for the farmer, the banker and the merchant. Upon the prosperity of these three—and the greatest of them is the farmer—depends the development in business education and civilization of the state and nation. The prosperity of the nation may be likened to an immense arch wherein every stone supports or is supported by others, all centering upon a keystone. The keystone of prosperity's arch, in any country or nation, is agriculture.

This report would be incomplete did I neglect to fully urge the importance of "Better Seeds for Maine." It is a behest handed down from the very earliest days of life's history that for the continuation of the development and productivity of our crops we must save a portion of our best for seed. There is a pretty story of the king who heard by chance of a new and more productive variety of maize than that grown in his own country and sent his wisest men on a journey lasting a year to a far country, searching for this new plant. No less than in the old days does the life of our people depend upon the corn we raise, and no less important is it that we plant our best each year, selecting carefully that our best may become better, until the people of some other town or country or state realize that our varieties are more valuable than their own and send their wise men here to buy of our seed. "Better Crops for Maine" does not mean that one or two in a community shall plant of their best. It means that every tiller of the soil who shall put seeds into the earth shall select himself the seed for the next year's planting or shall purchase from his neighbor who has a surplus. With our knowledge of culture and of fertilization, with our natural opportunities of soil and climate, with the planting of seed selected to fit our needs, we may adopt the words of James Russell Lowell to Maine, "Earth is so kindly there, tickle her with a hoe and she laughs with a harvest."

This is the age of progression. Unless we go forward we shall surely slip back. I believe the work so well begun on modest areas the past year must continue, and that it will grow and spread until it covers the whole field, and that as the work develops so will the quality and yield of crops in Maine improve and increase.

In closing this report I wish to thank all who have so ably assisted me in my work, particularly all the members of the Department. Only the most harmonious relations have existed. It has been a pleasure to give you my best work the past year.

Respectfully submitted,

C. R. LELAND,

Assistant Dairy Instructor.

REPORT OF STATE DAIRY INSPECTOR.

To Hon. J. A. Roberts, Commissioner of Agriculture:

I respectfully present my report as Dairy and Milk Inspector from January, 1914, to October, 1914.

As has been the case in previous years, the most of my time has been given to the inspection of milk and cream as it was being delivered to the consumer. Samples of these products have been collected from dealers in every section with the aim of ascertaining whether or not the supply was within the standard set by law. It is only right that the producer should know the status of his product before he offers it for sale, but often dairymen have been found whose interest does not go beyond the fact that the milk they sell is just as it comes from the animal, and they think that this fact alone absolves them from any criticism. For the average milkmen, places where milk can be tested to ascertain whether it is above or below the state standard are limited to the creameries, and to the few local milk inspectors who have the necessary equipment. Many times it has been recommended that samples of milk, as well as of the farm water supply, be sent in separate containers to the Laboratory of Hygiene at Augusta for analysis. Too often no effort to remedy conditions is made until after some fault is found and it is plain that not enough responsibility is felt with regard to milk as an important food.

In my work I have often come in contact with those whose livelihood depended upon the milk business and whose knowledge as to the proper care that milk should receive during its journey from the cow to the consumer is very much limited. It is evident that instruction, rather than a prosecution for violation with no understanding as to prevention or remedy of existing conditions, would be far better. With this thought in mind, there have been instances where the placing of the violator on probation and the withholding of prosecution for a time pending the result of instruction, have resulted more favorably.

Samples have been secured in forty-two cities and towns in every part of the state and the results published in the Quarterly Dairy Bulletin.

The results of the analyses of the samples of milk and cream are as follows: Whole number of samples, 1056; number above standard and clean, 600; containing visible sediment, 295; below standard in butter fat, 22; below standard in solids, 109; skimmed, 11; watered, 19.

The result of prosecution for violations is as follows:

Probation pending prosecutions	34
Pleaded nolo contendere. Found guilty and fined	3
Pleaded guilty and fined	1
Pleaded not guilty. Found guilty and fined	5
Nol prossed	1
Appealed cases, pending trial	2

EDUCATIONAL.

As much as possible, I have endeavored to make the work of this office enlightening to the producer and consumer alike, realizing that sometimes improvements result from education along the right lines rather than prosecution and payment of small fines.

Visiting farms has had to be given second place to the securing of milk from dealers, because of pressure of time. This inspection of farms should not be neglected, as the source of supply is the proper place to begin improvements. Later in this report, under the subject of "Recommendations," I have some suggestions for more efficient work along this line.

When farms have been visited and scored it has always been done with the idea of helping the farmer to improve rather than to criticize and censor his methods.

It has been pointed out that the dairyman who puts on the market a clean, wholesome product, becomes a benefactor to the community in which he does business, as well as to the entire state. On the other hand, it has been pointed out that unclean, unwholesome and disease-carrying milk is the foundation of the high death rate of infants and that it may be the source of serious disease epidemics.

A dairyman who produces and sells unclean milk in unsanitary surroundings or who allows cream to run through a separator that has not been cleansed, commits an insidious act toward all who are liable to use that product.

The pure food wave that has swept the country for the past eight or nine years, and the educational work that has been done along the line of sanitary milk, in the press, in the schools, in farmers' institutes and dairy meetings, have had their good effect, as have the passage and enforcement of the laws and regulations by the state and city governments and the centralization of the commercial handling and distribution of milk in the large cities. When, however, we come to consider the average run of milk produced on the average farm, and sold from the milk wagon, or dipped from cans in a poorly kept grocery store, we must admit that there is room for vast improvement, and the question may well be asked, How can such improvement be accomplished? The solution lies in further education to the producer and consumer alike along the lines of cost of proper production and ample compensation for the man who milks the cows after his production cost is known.

The most successful way of attracting the interest of the average farmer or other business man in improving his methods of doing business is to show him what the suggested improvement means to him in dollars and cents, or to attack his personal pride.

It is comparatively easy for our cow testing associations to convince the dairyman that the scrub cow producing not more than one hundred and fifty pounds of butter fat a year is an unprofitable animal and that the sooner he disposes of such animals the better it will be for him. Likewise the saving of a few cents a day on feed will cause him to change his feeding methods.

These facts can be clearly demonstrated, but when an attempt is made to convince the dairyman that cleaner milk should be produced, a problem is thereby confronted. The benefit of proper sanitary conditions in milk production cannot be demonstrated in so direct a way. The dairyman fails to see so readily that the returns from his dairy business increase in proportion to his standard of sanitation and the quality of the product obtained. This difficulty in many cases is augmented by the lack of inclination and unresponsive attitude of the average consumer towards milk of a high standard of purity. Too often the consumer regards milk simply as a household necessity or as a mere beverage which is to be secured as cheaply as possible. While he is ever ready to complain, he is not always ready to pay the price that an improved or higher standard product is well worth. The consumer's tendency has always been to pay too high a price for poor milk and too low a price for good milk. This same tendency holds true with the creameries and condensories. They know that a good product cannot be made from poor lots of milk or cream, but still very few, if any, grade the milk and cream, other than to ascertain whether it is sour or sweet, or pay on the basis of quality attained, with extra reward for high quality.

The payment for milk on the basis of its butter fat content has long been practiced by the creameries of the state, but the establishment of a payment on the basis of quality of product delivered, as determined by bacteriological examination, has not been done.

Why farmers and milkmen sell their product to dealers and consumers regardless of its percentage of fat, even, cannot be understood, as they know that the butter fat is the basis of payment from the creamery. Many times milkmen are found selling a milk rich in butter fat and if their milk was sold on that basis much more profit would result.

A payment for the milk according to the fat content and bacterial content seems to be fair to the producer and consumer alike. When this becomes a practice the housewife can have milk containing a lot of cream if she likes by paying slightly more for the butter fat. The milkman can sell to a creamery and receive payment for the actual butter fat content in his milk, so it would be only fair to ask an increase for the extra rich product.

Quality is the present day watchword in all food establishments and as milk is most certainly an important food, this watchword should bear a conspicuous part in this industry.

I have endeavored in my lectures before audiences to keep the foregoing suggestions in mind and to place before the public as much as possible something enlightening as to the importance of the milk situation.

Articles have been written for local newspapers in different sections, touching on the existing conditions and the improvements of the same.

My addresses before high school students have been a broadening of the field of lecture work, but it is a field of elementary education of milk conditions and I believe in time this subject will have a prominent place in the course of study of every student. Milk is a food with which nearly everyone has more or less to do, and its importance must be realized.

At the Central Maine Fair at Waterville and at the Maine State Fair in Lewiston, a milk and cream scoring contest was conducted. The government score card, having the bacteria content of the product as a basis for scoring, was used. Much interest is always taken in these contests by those exhibiting, but the average milk producer does not include his product in such a contest. To reach these men, I have advocated the sending of notices to all local boards of health and to all newspapers, and have sent the same, stating that this Department was ready to conduct scoring contests for any or all of the local milk dealers in the state. From the fact that the offer was not accepted by any board of health or any association of producers or consumers, one can hardly help concluding that there is an apparent laxity on the part of these bodies of officials, or at least that the status of our milk industry is not advanced in knowledge or inclination sufficient to entertain educational scoring contests in an effort to ascertain actual conditions and the improvement of such conditions if possible.

I have met with the creamery men of the state in assembled meeting and have discussed plans for improvement. It is their desire to secure more and better products and to this end they have signified their desire for the farmer to be educated along the line of economic production of a better product. They requested this office to prepare helpful suggestions to the actual producer of milk and this was attempted in number nineteen of the quarterly bulletin, under the title "Suggestions for Dairy Farmers."

Included in the Quarterly Dairy Bulletin, besides the analysis of samples collected and resulting prosecutions for violations, have been articles prepared in an endeavor to enlighten and instruct as much as possible those having to do with the production or consumption of milk, and impress upon them the responsibility that should be present on all sides.

The articles have appeared under the following titles: "Duties of Consumers"; "Cleanliness in Milking"; "Dairy Enlightenment"; "Tuberculosis and Milk"; "Our Reporting Method"; "Suggestions for Dairy Farmers"; "Milk Scoring Contests"; "Milk as a Food."

LECTURES.

I was privileged to address the Domestic Science classes of Portland and Deering High Schools at a joint meeting at Deering High School in January, the subject being "Food Sanitation." At that time two other classes were given short talks on "Sanitary Milk Production."

I was in attendance at a meeting of Winthrop Grange in January, where an address was given on "Dairy Improvement."

At the Biddeford High School, an address on "Food Sanitation" was given to the student body with other talks before two classes.

At an all day meeting of Foxcroft Grange in February, an address on "The Place of Dairying in Agriculture" was given.

Early in March, at a public evening meeting held under the auspices of the Westbrook District Nursing Association, an address was given on "The Relation of Producer and Consumer to a Clean Milk Supply." Both consumers and producers were present and engaged in the discussion following the address.

At the Farmers' Week Exercises at the University of Maine, an address was given entitled "The Improvement of the State's Milk Supply."

I was detailed as a speaker before Pine Grove Grange of Brewer and before Wales Grange in April, and before the Turner Cow Testing Association in June.

An address was given before the Androscoggin Valley Holstein Breeders' Association in June at Auburn.

I was judge of dairy products and in charge of the milk and cream scoring contests at the Central Maine, Maine State and Exeter Fairs. I also conducted the milking and butter fat contests at the Maine State and the Central Maine Fairs.

LOCAL INSPECTION.

Local inspection of milk in the state has been limited to a few cities and, as has been the case in the past, the work in these cities is limited because of lack of sufficient funds to procure a trained inspector, lack of proper equipment and facilities and frequent changes of office due to political preference. That such conditions are not conducive to better milk supplies must be evident, and gradually the work is being left to the state. To meet this condition, I have found that the greater part of my time has had to be given to collecting samples of the milk supply of cities and towns and I have had to give up many visits to dairy farms and further educational work.

In my previous report I have stated the attitude and status of local inspection and, as conditions have remained unchanged, no further comment is deemed necessary.

One city has attempted a bacteriological examination of its milk supply but, because of insufficient funds, the work is necessarily limited; however, results have been gained, even with the limited facilities present.

TUBERCULOSIS.

Several local boards of health have passed ordinances prohibiting milk from other than tuberculin tested cows from being sold. This has meant the compulsory testing of cows as a means of preventing the disease from being disseminated in the milk. This is a step in the proper direction but should not be attempted unless there is a thorough understanding of the situation and competent testing is to be employed. The farmer is usually the one who loses and he is hardly to be blamed if he dissents, but the health of the community is far more valuable than diseased animals and it is a true public service to rid any community of such animals. The testing and elimination of questionable animals should be in the hands of competent men who have concern for the interest of the farmer and consumer alike. It is a poor farmer who is willing to be uncertain as to the health of his herd, but at the same time he should receive the assistance of experts if he is to be compelled to submit to others the fate of his animals, which may be his means of livelihood. In questionable cases, the "Bang method" of control could well be used, whereby suspicious animals are secluded and retested after a certain period. Surely, such a method is fair and might mean the saving of valuable animals when the result of the tests is not exactly convincing.

Many inquiries have been made as to whether the testing of cattle for tuberculosis is compulsory by the state. In protecting live stock interests and preventing the transmission of disease from animal to animal, we have a law governing the transportation of pure bred stock, but none as regards grade stock except in interstate shipments. Pure bred live stock interests have taken measures for protecting themselves and, as a health measure, it might be well to consider all grades of dairy animals. The principal argument against such protective health legislation has been the fact that the appraised value would be too much to pay. Even if this were true, the health and protection of the people of the state would be far more valuable than any money expended for the disposal of diseased animals.

RECOMMENDATIONS.

The following recommendations are made to you as the result of nearly four years' work in the office and after being in contact with all phases of the dairy situation in this state; they are made in the spirit only of bettering existing conditions and procuring for the public a more sanitary product:

Licenses.

The present system of registration of milk dealers consists of a few questions being answered on an application blank and provides for no inspection of conditions before the certificate is issued. This registration exempts creamery patrons. A license system whereby all persons having to do with the sale of milk are required to reach a certain standard of cleanliness before engaging in the milk business, and the revoking of that license if conditions become poor, should be adopted. At present anyone, anywhere, can secure a certificate of registration and, as the expense is too great, no inspection is made unless a complaint is received. A small fee required for a license will provide for some inspection and the license will serve as a token of reward for cleanly conditions which milk production and sale require. The creameries of the state require and maintain a certain standard of cleanliness from their patrons, and stand ready to indorse and give their aid toward securing legislation requiring every person in the milk or cream business to have a license from this department.

Dairy Inspection.

More dairy farms should be visited and instructions in the production and handling of milk and cream given to the farmers. To this end competent instructors or inspectors should be employed. The source of supply is the proper place to begin improvement of the important food, milk, and instruction of the producer and milker is the important beginning.

Milk Inspection.

In January, 1914, samples of milk and cream were required by statute to be analyzed at the Experiment Station, Orono. Owing to increased distance of shipment and to very poor express delivery, the arrangement has hardly been satisfactory to this office. The work could be carried on more conveniently if a laboratory were situated in a more central part of the state where express shipments could be received better. As local inspection in cities and towns is being left to the state, more samples should be taken by more agents and a more complete examination of the milk, as regards the cleanly condition or freedom from disease, should be made. A central laboratory, situated in Augusta, where a chemical and bacteriological examination of the milk supply of each city could be made each month, would result in desirable milk conditions. An alliance with the State Board of Health with regard to a central laboratory has been discussed and it seems advisable.

The control of bulk milk sold from a quart measure in grocery stores is important. These measures are as much a menace to public health as was the common drinking cup, and should be eliminated by proper legislation.

The bacterial content of milk and cream in our large communities should be known and an examination made for milk carrying disease-producing germs.

Legislation that would protect the shipper and milk dealer would be that which required milk cans to be sealed during shipment over railroad or trolley lines.

Local inspection, when carried on without knowledge or sufficient funds or competent men, is nearly useless. The state should appropriate sufficient money to carry on a more complete inspection, including the analysis and examination of the milk supply, inspection of dairy farms and the instruction of the producer and the consumer by school and other public lectures.

The results that can be secured with one inspector for the entire state are at their best unsatisfactory; the extent of territory is too great, the duties too many, and the securing of samples not frequent enough, to accomplish what should be accomplished by efficient inspection. The funds for future work should be at least doubled and better trebled, to allow for more help and better results.

I regret to have to leave the department and the inspection work at this time, but it is made necessary by my accepting a position with the Federal Dairy Division at Washington, D. C. I have received many favors and much help from the several members of this department, the associations with whom have been so pleasant.

I desire to thank you for your generous regard for my endeavors to carry out the many duties of this office. The clerical and other members of the department have rendered valuable assistance at all times. The newspapers of the state, as well as many prosecuting and other court officials, have given the milk situation its proper importance.

In my new field, any help that I may be able to give to you or the other members of the department, will be given with pleasure.

Respectfully submitted,

RUSSELL S. SMITH,

Dairy and Milk Inspector.

Young Orchard of C. C. Washburn, Minot.

REPORT OF STATE HORTICULTURIST.

To the Honorable John A. Roberts, Commissioner of Agriculture:

I herewith submit my fourth annual report as State Horticulturist, for the year 1914.

Up to the first of July, the work of the bureau was divided into two sections. I undertook the supervision of the potato inspection in Aroostook County, and Mr. Sweetser undertook the supervision of the usual orchard work. The data on the potato inspection will be found later on in the report. On the general resumé of the work done this year, would say that apple packing schools were conducted in three towns in the apple centers, spraying demonstrations were given as heretofore upon solicitation from the growers, the usual inspection of nurseries and nursery stock was carried on, some work was done in inspecting apples in the fall, and the usual time was devoted to the fruit shows. During the year, Mr. Sweetser and I judged fruit at Somerset Central Agricultural Fair, Maine State Fair, Sagadahoc County Fair, South Kennebec County Fair and the Pomological Fruit Show.

In regard to the apple situation would say that the outlook in the early fall was far from encouraging. The Government estimate of the crop was given as 70,000,000 barrels, the largest yield in history, and this estimate, together with the declaration of war in Europe, resulted in a very serious market depression. Generally the state is actively canvassed by different buyers and the competition for fruit is more or less keen. This season proved the exception and in the early buying season these men were conspicuous by their absence. When the buyers did begin to take an active interest in procuring fruit cold weather had set in and hundreds of barrels of apples were frozen. Quantities of fruit were left on the trees or shaken off and left on the ground. Fruit could have been bought on the tree for from twenty-five to fifty cents a barrel in many sections. Buyers paid generally $1.25 a barrel f. o. b. loading station for Fancies, ones and twos.

The folly of disposing of our apple crop through local buyers has been painfully apparent and it would seem that a strong current of feeling should be manifested in coöperative organization. Many growers who have hitherto depended upon the local buyers were forced to consign their fruit to commission men, dispose of it in local markets, or allow it to remain on the tree. Because of the unsettled market conditions and the fact that such men in a majority of cases were unknown to the trade, prices were far from satisfactory. Growers who had been disposing of their own crop for a period sufficient to give them a market standing received from $1.50 to $3.00 a barrel for their fruit. Many of these men and some of the associations took advantage of cold storage so that a good deal of Maine fruit remains yet unsold.

Probably the fruit from Maine this year was as good as has been produced thus far. The season was not conducive to scab in the early period and developed into a fine fall for maturing fruit. Because of this and the fact that insect infestation was below normal, fruit was clean, attractive and of extra fine quality. It is estimated that the commercial production this year will be in the vicinity of 600,000 barrels as against 340,980 for last year.

One new association has been added during the year, known as the Kennebec Hillside Fruit Growers' Association of Kent's Hill and it is expected that good work will be accomplished as it is made up of keen, live apple growers.

The Oxford Bears Fruit Growers' Association succeeded in getting the contract for the fruit sold on the Maine Central Railroad. Hitherto the railroad has sold practically all western fruit. This should make a good foundation for the establishment of a fancy Maine trade, which ultimately can drive the western fruit out of our local markets if proper attention is paid to pack and package.

Cold Storage Plant.

A new cold storage plant has been erected in Portland and a capacity for 50,000 barrels of apples guaranteed to the growers this year. The writer has been through the plant and was very favorably impressed with it. It is a modern, up to date cold storage, well designed and well located, and no doubt the farmers in the state will profit through the advantages it offers.

Apple Packing Schools.

Following the practice established a year ago, the demand for instruction in box packing of apples seemed to be most satisfactorily met by holding three-day schools in the towns from which requests for such were received.

Schools were scheduled for three different towns:

Hebron, February 3, 4, 5, E. Hebron Grange Hall.

Skowhegan, February 10, 11, 12, Municipal Building.

Union, February 17, 18, 19, Seven Tree Grange Hall.

The department furnished tables, paper, boxes, etc., and the local men furnished the fruit and a hall in which to work. At Hebron and Union, dinner was served each day by the ladies who were interested, so that little time was lost during the nooning.

The school at Hebron was in charge of A. K. Gardner, but on account of the emergency work in the powdery scab infestation, it became necessary for the other schools to be conducted by H. P. Sweetser, assistant horticulturist. C. E. Wheeler of Chesterville was called to help in the instruction work and proved to be an able assistant.

The program followed at each school consisted of instruction in both box and barrel packing, a daily session for general discussion, and, following dinner the first two days of each school, it was planned to have a stereopticon lecture. One was given by Major E. E. Philbrook on "The Methods Used in the Control of the Gypsy Moth," and the other given by a member of the bureau on "Varieties of Apples and Orchard Extension Work." Both of these lectures proved popular.

The final day at each school was devoted to a box packing contest consisting of packing a box of apples complete for the market. This contest aroused considerable interest and was won by Alfred Badger of Hebron. A suitably engraved watch charm was presented at a reward.

The largest attendance was at Union the last day of the school, when seventy-five members were present during the greater part of the day. The average attendance for the nine days was thirty-five.

The school at Skowhegan was a failure compared to the other schools, but the bureau has no excuse to offer and makes no further comment.

The success of the other schools at Hebron and Union more than makes up for all disappointments as all who attended are ready to testify.

Fruit Growers' Conventions.

In the spring of 1913, the first Western Maine Fruit Growers' Conference was held in Auburn Hall, Auburn, Maine. The success of this meeting assured the promoters that another similar meeting could be held and February 23, 24 and 25, 1914, were the dates selected for this second conference. The success of the first meeting in 1913 had been heralded far and near and the fruit men of eastern and central Maine asked that a conference be given at Bangor in the spring of 1914, following the proposed Auburn meeting.

The Auburn Fruit Growers' Association and the Auburn Board of Trade took the lead in making the local arrangements at Auburn and the Bangor Chamber of Commerce attended to the details of the eastern meeting. Coöperating freely with these organizations, the State Department of Agriculture attended to much of the advertising and railroad rates, and most of all, provided the speakers for the meetings and arranged the programs.

The Auburn Meeting.

PROGRAM.

Monday, February 23, 1914, 7.30 P. M.

Registration.
Address, Hon. A. W. Fowles, Mayor of Auburn
Address, F. S. Adams, Augusta, Department of Agriculture
Stereopticon Lecture, The Gypsy Moth in Maine and its Control, Major E. E. Philbrook, Augusta Department of Agriculture

Tuesday, February 24, 9.00 A. M.

Round Table Talk, Conducted by H. P. Sweetser, Augusta

Questions on:	Answered by:
Pruning, Renovation,	G. A. Yeaton, Norway
Fertilization, Cultivation,	W. H. Conant, Buckfield
Spraying,	Dr. W. J. Morse, Orono
Thinning, Picking,	H. L. Keyser, Greene

2.00 P. M.

Cultivating and Fertilizing the Orchard, W. H. Woodworth, Berwick, N. S.
Spraying, Dr. Donald Reddick, Ithaca, N. Y.

7.30 P. M.

Supper.
Speaker of the Evening, W. H. Woodworth, Berwick, N. S.
Toastmaster, H. N. Chase, Auburn

Wednesday, February 25, 9.00 A. M.

Round Table—Continued.

Questions on:	Answered by:
Foreign Markets,	E. E. Conant, Buckfield
Native Markets,	H. L. Keyser, Greene
Local Markets,	A. L. Merrill, Auburn
Grading, Packing,	H. L. Conant, Hebron
Branding,	C. E. Wheeler, Chesterville
Coöperation, Storage,	Prof. B. S. Brown, Orono

2.00 P. M.

Coöperative Storage, G. H. Vroom, Middleton, N. S., Chief Dominion Fruit Inspector, Maritime Provinces, District 1

Selling Your Product, J. S. Orcutt, Boston, Mass., Secretary Agricultural Committee, Chamber of Commerce

The Bangor Meeting.

PROGRAM.

Thursday, 1.30 P. M.

Opening Remarks, Charles F. Bragg, President, Bangor Chamber of Commerce

Cultivation and Fertilization, W. H. Woodworth, Berwick, N. S.

Selling Your Product, J. C. Orcutt, Chamber of Commerce, Boston, Mass.

8.00 P. M.

Illustrated Lecture on the Orchard Extension Work, H. P. Sweetser, Augusta, Maine

Coöperative Storage, G. H. Vroom, Chief Dominion Fruit Inspector, Middleton, N. S.

Friday, 9.00 A. M.

Round Table Talk, Conducted by H. P. Sweetser, Assistant State Horticulturist

Questions on:	Answered by:
Pruning and Fertilization,	W. H. Conant, Buckfield
Renovation,	Prof. E. F. Hitchings, Orono
Spraying,	Dr. W. J. Morse, Orono
Storage,	H. L. Keyser, Greene
Branding,	C. E. Wheeler, Chesterville
Packing,	Prof. B. S. Brown, Orono
Local Markets,	E. E. Page, East Corinth

1.30 P. M.

Foreign Markets, E. E. Conant, Buckfield

Illustrated Lecture on Orchard Pests, Prof. E. F. Hitchings, Orono

Strip Cultivation.

ADDRESSES GIVEN AT THE AUBURN MEETING

CULTIVATING AND FERTILIZING THE ORCHARD.

W. H. Woodworth, Berwick, N. S.

(Stenographic Report)

I need not say that I am very glad to meet you,—some of you for the first time, some of you again. I feel flattered with what the chairman has said, that you like me. If you came down to Annapolis when we are packing our Gravensteins, you would like us and you would like our apples. I will in a few minutes give you a little description of the Annapolis Valley where I live. The Annapolis Valley has not been as well advertised as the Hood River Valley. We have not got on to the idea of advertising quite as well as those people have. It is not a very long ride from here to the first end of our valley. You leave here at noon, you are in St. John in the evening, the next day you take the steamer over to Digby and you are at the entrance of the valley. It has an average width of 4 to 10 miles. It is drained by two rivers, and the water shed is at Berwick, where I am located. We in the past have had great success in growing fruit. I think I told you last year that our largest crop was two million barrels. The railroad traverses the whole length of the valley, beginning at Yarmouth and ending at Halifax. Our shipping port is Halifax. In the last four or five years we have organized a coöperative company which is doing grand work. All along the line of the railroad at the stations we have apple houses. We pick our apples and take them to the warehouses and expert men pack them and brand them and they are shipped to the old country, principally to London, Liverpool and Glasgow. We send apples to Newfoundland, and to Cape Town, Africa, and our markets are increasing every year. This coöperative company, with 32 different warehouses, is connected with the central association at Berwick. That central association has for its duties the marketing of the fruit. It is in touch by telephone with every packing house in the whole valley. The associations have their president, and these houses have a foreman and expert packers. The gentleman who is at the head of the central association is Mr. Adams. He is in touch with all the markets of the world. He watches the markets and watches the shipments and this year he has been successful in placing a large majority of the apples of the coöperative company on steamers that arrived in London and Liverpool when the market was high. He holds the lines, as it were, and when Glasgow is bare of apples he makes a shipment. He watches all the shipments from New York and Boston; and in that way we have got a great deal better price for our apples. The steamers are chartered and the cars placed by the central association, and it costs 3 cents a barrel. $12,000 pays all the expenses of all the work of that association.

I could go on showing you that the old system of selling to speculators or shipping apples on consignment does not compare favorably at all with shipping under the coöperative companies, but Mr. Vroom is here to talk upon coöperation. The coöperative system is working finely. Before you, in this state, get that coöperative system worked out, you will find it a very nice way to handle apples by having warehouses at the railroad stations in the district, where you can take your fruit in the autumn and have it stored, and pack it in the winter. We haven't any cold storage plants in our section. Of course our Gravensteins are practically out of the country by the 10th of October, and our Kings and some other varieties go out, and it is the winter fruit we hold in the warehouses. I was at Round Hill, a station 40 miles below Berwick, and the manager of that warehouse told me he had 4,000 barrels of Nonpareil, and they were offered $4.00 per barrel for the whole outfit. $16,000 was quite a little money to distribute around in that section of the country.

There are a good many factors that go to make up good orcharding. Among the most important is cultivation and fertilization of the orchard. In taking up the subject of cultivation this afternoon, I would say that we cultivate our orchards—and a good deal of this applies to the general farmer—having four distinct notions. The first is to break up the dormant plant food in the soil; the second, to improve the physical condition of the soil; the third, to conserve the moisture; and the fourth, which is not of very much importance, to kill the weeds. The reason that it is not of much importance is because while we have been cultivating the soil for these other purposes the weeds have been destroyed.

In taking up the analysis of soils, we find that the soil contains nitrogen, phosphoric acid and potash. These have been wisely placed in the soil for the growth of plants. There is one other element that we need in order to get a successful growth, and that is humus or decaying vegetable matter. If you young men especially, that are in the orchard business, would think for a moment, and keep thinking while you are carrying on your farm operations, on these important points, it would help you.

As an implement of cultivation of course the plow is very important. I will give you a description of just about how we carry on our orchard cultivation. In handling large areas, and a good many of us have 50 or 60 acres in orchard, it is impossible for us to plow so much in the spring. If I had a few acres of orchard on a light soil I would plow in the spring simply because I could get onto that land early enough to conserve the moisture. In my own case I do fall plowing altogether. Our land is a clay loam and we plow after we have picked the crop of apples and would like to plow after the leaves have fallen because the leaves carry so much humus, and we have been told that the spores of the black spot that are on the leaves are covered and a good many of those spores are killed; however, we have always found that plenty of them live. On the side hills I would not advise fall plowing, but where you have large areas you will have to do some fall plowing because you could not get the plowing done in the spring in time to go on with your other orchard operations. We plow our land in the fall and put it in good condition and then it is in good condition to hold moisture. We are depending on the rain and snow for the water the tree requires for its summer growth. The soil acts as a sponge to absorb the water. As soon as the land is dry enough we go on with a harrow. The first implement we use in the spring is a cutaway harrow and that will imply that you must have a pair of 1250 or 1300 pound horses to handle that harrow, and I like the Clydesdale. Then you can go into the field and do ten hours' work. You want to go through the orchard both ways.

I would harrow the land until it is very fine. We must put our orchard land into as fine a condition as the flour in the barrel. Then the land is in a condition to be acted upon by wind, sunlight and frost, and other elements that break up the plant food. The nitrogen, phosphoric acid and other materials are locked up in the soil and it is only by the process of cultivation that we can liberate that plant food so that it is available for plant life. When the orchard is thoroughly harrowed with a cutaway harrow, the next implement is a spring tooth harrow. In about ten days we put the spring tooth harrow over it a couple of times, and after that it is fine enough for a section harrow. We go over our orchards every eight to ten days, and always after a rain, to break up the soil and have it in a fine condition.

My first reason for cultivation is to break up the plant food. My second reason is to give a good physical condition to the soil. If the soil is coarse, and in lumps, the plant food is not available, and the more you fine the soil the better chance it gives the little roots to do their work. If you dig up an apple tree after one year, you will find the little fibres going out in all directions. Those are root hairs. It is by that process that the plant gets its life. The plant food is taken in by the plants in a very dilute condition. It takes an enormous quantity of water to carry the plant food to the plant and if the soil is as fine as it possibly can be made then the elements of plant food are placed in close conjunction with the little feeding roots and the plant has a very much better chance to make a good growth than if the land was all clod. Every man who goes out in the spring to farm has this idea with him,—that he must manipulate the orchard so that he will make the most money possible, and in order to do this, you must practice improved methods; and as you study the question you will find that the finer the soil is made the better chance the tree has of having a good seed bed, and the seed bed applies as well to the apple tree as to the growing crops.

Then the conservation of moisture is a very good thing. I do not know the exact percentage of moisture in the apple,—perhaps 80 or 90 per cent. When we are selling apples we are selling a good deal of water. In order to get that water into the apple crop you must cultivate the soil. Any man who has had any experience knows that when a field is hard and flat, in the summer time, you will find it dry away down. But go into your corn fields and potato fields and orchards that have been well cultivated and you will find a very different condition. Stationary water that was held in the soil in the early spring remains in the soil. That stationary water in the soil is the reservoir from which the plant gets its water for growth during the summer. If you could place a mulch over your entire farm, of straw or burlap or boards, on lifting that you would find moisture under it. The water that has been drawn from below by capillary attraction has not had a chance to evaporate. When the field is in an untilled condition the capillary tubes bring the water to the surface and you lose it by evaporation. If you take a brick and place it in a plate of water and leave it there for some hours, you will find that the brick has become damp to the top. Take that same brick and place some dry, finely pulverized dirt on top and you find that the moisture will come up to the top of the brick and above that the dirt is all dry.

The brick is a type of the piece of dirt. If you stir the dirt with a harrow you break up the capillary tubes down three or four inches. The capillary tubes draw the water up to where the break is, and that blanket of fine soil spread all over the land acts as a mulch that prevents the evaporation and the water that is contained in that land goes into the feeding roots of the plant, out through the leaves, and you get growth. That water carries with it the nitrogen, phosphoric acid and potash which is the food of the plant. To grow a ton of dry matter, it takes 500 tons of water to circulate through the crop and go off into the air through the leaves and do its work. The man who neglects the cultivation of his orchard finds yellow leaves, small fruit and scrubby trees. The man who cultivates it finds luxuriant growth, well colored fruit and a profitable crop. The man who understands soil cultivation thoroughly finds that he has an abundant and profitable crop, whereas the man that neglects the cultivation, as we used to do 30 years ago, going out in June and plowing it and scraping it over with a harrow once, does not get results.

Ques. How deep do you plow?

Ans. We plow our orchards about four inches. If in the commencement of your orchard operations you plow 5 inches and continue to plow to that depth, it will be all right, but if you have been plowing four inches and then go down another inch you will find you are cutting off the little feeding roots too much.

Ques. Do you use a double action cutaway or single?

Ans. Single. I have never found a harrow that would cut the soil up and pulverize it as well as the cutaway. The earlier you get onto the land the more water you conserve. The man who lets his orchard remain until the first of June without putting a harrow onto it is very foolish. He is losing hundreds of tons of water which evaporates. I would rather have a real dry summer with good cultivation than a very wet summer and no cultivation. If you find your orchard needs underdraining, that is the first thing to do. Get the water down first and then get it up afterwards.

Ques. Does it make any difference about holding moisture whether the sun shines or not?

Ans. No. You want to get the top surface dried out and the dryer the top surface is the better. You want to do all the business $2\frac{1}{2}$ or 3 inches below the surface. There is where you want the moisture and you will get it there by cultivating.

Ques. What is your soil in the valley?

Ans. We have on the north side of the valley a high mountain with trap rock and clay soil. On the south mountain it is a granite formation and somewhat stony. The conditions up our way are just about the same as in Maine.

Ques. How near to the trees do you plow and cultivate?

Ans. Close up to the trees. I do not know as it is beneficial but it looks better and I think a strip of grass by the trees is a harbor for insects. Of course there are different ways of training the trees. Our trees in the past have all been trimmed up so that you can get around them with a horse.

Ques. How high do you have the trunks of your trees?

Ans. About four feet or a little over. We cannot drive a team very close to them and still we have plows fixed so that we can set the plow over and plow nearer the trees. We do the most of our plowing with a two furrow plow.

Ques. Do you advocate cover crops?

Ans. Yes, I will take that up with the fertility.

In regard to fertilizing our orchards, we use barnyard manure, cover crops and commercial fertilizers. In spring time an orchard about 20 years old gets 500 or 600 pounds of acid phosphate or basic slag or fine ground bone for the phosphoric acid. We put on about 200 pounds of muriate or sulphate of potash according to the soil. A clay soil would not need as much potash as a sandy soil. Then we must have nitrogen in order to grow any crop. It is one of the most important fertilizers we have. The cover crops are full of nitrogen if you sow the right kind, and barnyard manure has a good deal of nitrogen and is a fine thing for growing young trees; they could not have anything better.

I have 25 or 30 acres of orchard that never saw barnyard manure, the orchards having been grown entirely on fertilizers and cover crops. I have other orchards fertilized with barnyard manure and I cannot see very much difference. I could not give any set rule for fertilizing orchards. In the orchards that I fertilize with commercial fertilizers I sometimes vary the fertilizer. Last year I put on 700 pounds of slag, 150 pounds of muriate of potash and 700 pounds of ground fish fertilizer,—this analyzing about 9 per cent of ammonia and 8 per cent of nitrogen. You may think that is too much but in our valley we can hardly ever over-fertilize. When a man has 40 or 50 acres of orchard there is not much danger of his over-fertilizing. He looks at the money and it looks big and he does not have faith enough in the results.

Ques. About how far apart are your trees?

Ans. About 33 feet, and I would not plant them any closer. I would rather plant 40 feet apart. I might put in a filler for a little while, but in our country I have never seen a filler cut out.

I think that you do not sow the right kind of cover crops. I wonder how many men in this audience sow summer vetches in their orchards, a bushel or a peck to the acre? Humus is most important to the farmer. The problem of maintaining and increasing the store of humus is the most important problem our farmers are confronted with. Now what is the reason that this question of humus is of such vast importance? Because the humus is a great source of nitrogen. Humus is decaying vegetable matter, and in decaying vegetable matter you get the same constituents in the soil that it took to build the plant life up with. The plants get these constituents from the soil and you are returning them to the soil. Humus also contains phosphoric acid and potash. Then this decaying vegetable matter improves the physical condition of the soil. It acts as a sponge to hold the moisture. Humus is also obtained from the barn cellar manures. One of the principal offices of humus is to put the soil in a condition so that the bacteria can act upon it. There are immense numbers of these bacteria in the soil and they cannot do their work except when the soil is made fine. If you neglect to incorporate vegetable matter in your soils you will find that in a very little while the soil will cease to respond. On the mountain where I live the farmers began to plant potatoes on commercial fertilizer. They used half a ton of a mixed fertilizer, 4-8-10. The next year they used 1500 pounds to get a good crop and the next year 2,000 pounds, and did not get as good a crop, and the next year they did not get any crop at all. They had used up the supply of humus. It is said that out in Dakota and Minnesota there are American farmers who have grown wheat 30 years on the same soil until they cannot produce a crop, and I hear they are going over into Canada. If the people in the West had only known that humus is the key to fertility how much better it would have been. I fancy they are going to rob Canada West of its fertility. The fertility of the soil is in the humus and in the bacterial life and if you gentlemen who have undertaken to grow orchards in the State of Maine do not pay more attention to this humus you are going to fail. If you do not sow a cover crop on your orchard you had better begin. You are taking a crop out of the soil every year in the form of apples. You may be generous enough to put back commercial fertilizers, but those alone will not do. Do not expect to get good returns from commercial fertilizer without cultivation and without the humus in the soil. There are two classes of plants, as you have heard many times, that provide humus and provide something else. Clover is charged with nitrogen. Some 25 years ago it was discovered in Germany that tiny nodules on the roots of the clover are not a diseased condition but they are the home of the bacteria peculiar to the clover plant, taking out of the air the nitrogen that is in it and storing it in the clover plant. The same is true of the vetch. The seeds of the summer vetch are almost as large as a sweet pea. If you sow that cover crop about the first of July, the land is damp and it comes right up and in our orchards before the apples are picked we get a cover crop two or three feet high.

We are getting ten or fifteen dollars' worth of nitrogen by sowing the vetches, and getting the humus as well. To grow buckwheat or timothy hay or oats on our orchards would be to take the nitrogen out of the soil, whereas vetches and clover and all the plants that belong to the leguminous class are nitrogen collectors. That is the reason I can grow luxuriant trees, that is the reason I can grow good crops of apples, because I am procuring the nitrogen from the air, and it is the most expensive fertilizer we have. No good orchardist in the Annapolis valley would think of such a thing as to grow an orchard without growing a cover crop, and a cover crop of the right kind. The man who sows buckwheat is making a mistake. He gets some humus but he has lost the nitrogen. You may get bigger clover crops, but I get a better crop with the vetches.

Ques. What time do you sow the vetch?

Ans. About the 25th of June; not later than the first of July anyway. The reason I would not sow it earlier is that I want to keep up the cultivation while the growing season is on and conserve the moisture. About the first of July you want the trees to stop growing and want the fruit buds to form and ripen. An excessive growth late in the season is sure to result in winter-killing. The nurseryman who forces his trees to grow up to the first of November will find that they will be winter-killed if there is a severe winter.

Ques. What kind of vetch do you use?

Ans. It is the summer vetch or tare that costs $2.00 a bushel. We have always found that when we have enough fertilizers in our orchards vetches will grow luxuriantly. If you have an abundance of potash and phosphoric acid in your land, then the addition of nitrogen gives you the full results. If you haven't enough phosphoric acid, then phosphoric acid would be the factor needed. Generally speaking, when you get an orchard into a good state of fertility, with enough plant food, there will be no trouble about the vetches. It may be that the bacteria for the vetches is not in your soil. You had better buy a bushel of vetch seed and with it you will get a little bottle of bacteria peculiar to that seed. Wet the vetch seed with it, and it will grow finely. The same is true with clover.

Ques. Why do you use the summer vetch instead of the winter vetch?

Ans. Because it is cheaper. The winter vetch is nine or ten dollars a bushel.

Ques. What do you use for a plow?

Ans. The two furrow walking plow.

Ques. Do the roots of the vetch get into the soil and live over?

Ans. No, it never bothers us. I notice the vetches that grow in our orchards are just covered with the nodules. If you pull up a plant when it is growing you will notice these little white nodules.

Ques. Do you plow it under in the fall?

Ans. Yes; we plow it under about the 20th of October, as soon as the apples are picked.

Ques. Where do you buy the vetch seed?

Ans. It comes from England. The coöperative companies buy it by the hundred bushels. You can add a little buckwheat to the vetches.

In regard to fertilizers, do not go out and buy commercial fertilizers and throw away the fertilizer that might be made on the farm. Any man running a dairy ought to run an orchard in connection with the dairy. If he has a barn cellar he can keep pigs there and he can make fertilizers for his orchard. I knew a man who grew 4500 barrels of apples and used nothing but barnyard manure and a little potash. You can grow fruit in this way if you manage it right. An excess of barnyard manure would give you luxuriant growth and then of course your trees must be kept trimmed out; and you might get some green fruit, but as a rule in our valley the trouble is want of fertilizer rather than too much.

Ques. How many loads of manure would you use to the acre?

Ans. About ten loads of a ton each.

Ques. In setting your trees, do you put them square or triangular?

Ans. I put them out at right angles. I have one orchard with fillers but I do not like that way, and we have lots of land.

Ques. You plow in the fall and leave it in the furrow until spring?

Ans. Yes; where we have such a lot of orchard, we will have land that we cannot get onto until late. We have never seen any ill effects from fall plowing. Our trees look well. Scientific men may tell you not to plow an orchard in the fall, but in our country the orchards are plowed in the fall altogether except where the soil is very light and the man has a small orchard.

I tell you, gentlemen, there is money in growing fruit if you grow it right; but if you want to grow fruit you must grow good fruit, and that is the reason I am paying particular attention to those two important factors. I am really astonished that there are men all over this audience who have not sown cover crops. I dare say you have done the cultivation very well, although some people tell me there are lots of orchards here in the sod. Of course we cannot grow timothy hay and a crop of apples.

Ques. Is it practicable to grow peas for a cover crop?

Ans. Some people do that. Peas are a leguminous crop and you will get good results.

Ques. Have you ever tried running a clover crop over one year; clipping it off, and plowing it in the next year?

Ans. I have grown clover in my orchard as a crop, but the trees dried out very much and the leaves turned yellow. The clover takes so much moisture from the soil that the trees suffer. I have never struck any method which includes cultivation by which I could let any crop grow during the summer. In our young orchards we cultivate the land for the first ten years and get good returns from the cultivation of that soil. Of course for the first five or six years we do not get very much returns from the orchard. I believe the right way to grow orchards is to grow them in connection with general farming. I am not so sure that a certain number of men can form a syndicate and go out and buy land and grow apples, waiting for returns, and make very much money; but we are all growing more or less apples.

Ques. What kind of crops do you grow in the young orchards?

Ans. We follow a rotation. For instance, if we are planting an orchard on an old, run-out field, we plow it up and give it good cultivation, using commercial fertilizers, put in the trees and perhaps the first year put in a crop of potatoes. These might yield 250 bushels to the acre. I have done that on a five acre field. The next year follow with wheat, sowing the wheat up within three or four feet of the trees, and sowing clover at the same time. Then you can cultivate around the trees, and have a crop of clover between the trees. The next year plow the clover under. This makes a three years' rotation,—roots, grain, clover. Anybody who ever raised potatoes or mangels on a clover sod has found that that is the best condition. You have nitrogen and lots of humus. Keep that up for nine years and if you manage right you will make some money out of it. There is a good deal more in the man than there is in the soil or the surroundings or anything else. It is a business proposition. One man will start in orcharding, in our country, where farms are low and the climate favorable, and he will get a mortgage on his farm, and another man starting at the same time will be loaning him money. You cannot grow fruit and make money out of it unless you study the fruit business and make it a business proposition. A good many of our farmers know the truth but they do not put it into practice. It may be that you have heard repeated at institute meetings over and over again what I have told you today,—sow a cover crop and maintain the humus in your soil. You may hear that for the next ten years but if you do not act upon it, it will not avail you much.

Ques. If you had clipped off the clover instead of raising it for a crop, would it have dried out the land?

Ans. Yes; you want the cultivation up to July to conserve the moisture.

Ques. What protection do you give young trees in the winter?

Ans. I would not give them any. We usually put out trees three years of age. We do not put them on the top of the ground and not away down in the subsoil but deep enough so that they will have a good hole. I dig a good wide hole, with a good distance around it, and then I take some of the top earth that is richer than the other soil and take a couple of quarts of commercial fertilizer and mix it all through that top soil and then I get down on my knees (for once) and plant the tree and put the fertilized soil around it. The trees never stop growing, and we never bank them. It is ruinous to put straw or anything of that kind around them because the mice will eat the bark.

I want to mention another thing in regard to fertilizers. A great many men in this country are using a 4-8-10 or 3-8-7,—a mixed fertilizer. If you buy potash at the market price, and if you buy phosphoric acid in the form of acid phosphate, you will be able to save the sum of $10 a ton which you pay for the mixed fertilizer. If you buy a cheap commercial fertilizer you will perhaps get 2 per cent nitrogen, 2 per cent phosphoric acid and 9 per cent potash, and the rest dirt, and you are very much disappointed if you cannot get a ton. Very likely you could bring home in a pocket handkerchief all the fertilizing principles in that fertilizer. The fertilizer manufacturers take a certain amount of nitrogen, phosphoric acid and potash and put it into a mill and grind it up and then put in a filler which costs about $8.00 a ton. Why not buy your acid phosphate and your muriate and your basic slag and mix it yourself? Or you need not mix it. I use all my fertilizers separate. I go along with the phosphoric acid and then with the potash and it is mixed when it is sown on the surface of the earth. We do not use mixed commercial fertilizers on our farms at all. You can save from eight to ten dollars a ton by buying chemicals.

CO-OPERATIVE FRUIT STORING AND PACKING IN NOVA SCOTIA.

By G. H. VROOM, Chief Dominion Fruit Inspector, Middleton, N. S.

The development of coöperation has been very marked in the last few years in nearly all the countries of Europe, and in America coöperation has reached enormous proportions.

Take as an example the Coöperative Selling Association for citrous fruits in California. In different parts of the United States coöperative selling associations have worked out principles that can be adopted now with confidence.

The apple industry originated in the orchards of the earliest settlers planted primarily for their own use. Their orchards supplied not only the needs of the family but also those of nearby markets. A little later there was a surplus after the local demands had been met and some enterprising merchants and growers began to ship a few barrels to the markets of Great Britain, and they found that the fruit was acceptable and yielded good profits.

The first shipment of apples from Nova Scotia to London was in 1849, and they netted $2.00 per barrel.

In 1859 Ambrose Bent shipped 700 barrels to Boston and they made $2.75 per barrel.

In 1861 A. W. Corbett shipped some to London, and in 1881, the first steamer to carry apples direct sailed from Annapolis Royal with 6,800 barrels. Ambrose Bent went as supercargo. The steamer was 14 days on the passage, and it was a paying venture.

This created a boom in orchard planting and helped to develop the long distance export trade. The handling of the crop naturally fell into the hands of dealers who very quickly monopolized the trade connections, to such an extent that they could practically dictate the remuneration returned to the growers, and in this condition the trade has continued almost to the present time.

In Nova Scotia the dealers were usually associated with some strong English firm who made advances on the apples in their possession and who eventually built warehouses at the points of production in order to secure a better hold upon the fruit. Not content with this, certain dealers sometimes secured control of the transportation facilities, so that rival shippers and independent growers had some difficulty in moving their fruit. Some of the shrewdest men among these growers, too, were employed to act as soliciting agents, and by these devices the dealers secured almost absolute control of the trade.

In Ontario, apple orchards were not so concentrated, and it was somewhat more difficult to secure such control. However, the distance from the markets and the inability of the English firms to become acquainted with the local conditions, enabled a comparatively few men to pose as exporters. There grew up a large army of local buyers more or less under the control of the exporters, and at times the competition among these kept prices fairly well up to a point corresponding with the price in the foreign market. In later years the competition between different buyers became merely nominal and the business in Ontario was so shrewdly organized that the apple grower got just a little more for his fruit than his actual expenses. For this reason there was no incentive to increase the orchard area. In fact, after this régime had more or less complete control, the orchard area began to fall off most seriously, and it was no uncommon thing in the decade beginning 1890 to see splendid orchards chopped down for firewood. It was under these circumstances that the coöperative movement began. It was adopted by Ontario as a sort of last resort. In this it follows the history of coöperation in every land and in connection with every industry. It is seldom indeed that it has been adopted during good times or while industries were flourishing. But though adopted with little hope it has never failed to improve conditions.

The development of the apple trade in Nova Scotia is similar to that in Ontario and it began about the same time. About 1870, shipments from Nova Scotia to London were in large enough cargoes to attract attention. Many of these apples were sent in sailing vessels from local ports and, as might be expected, the condition on arrival was variable. There was no provision for ventilation, and even if there had been none of those delays so common to sailing vessels, it would have been a difficult matter to have landed apples in London to do justice to Nova Scotia. Steamers sailing from Boston were then induced to come to Halifax for a part cargo of apples, and this helped the situation considerably. Later, of course, Halifax secured a direct line of steamers that has served the needs of the trade more or less satisfactorily up to the present time. The exports in 1880 were only 24,000 barrels, and in 1886, 177,500 barrels. The phenomenal crop of 1896 gave a surplus of something like 500,000 barrels and the 1911 crop gave an output for export and long distance shipments of 1,500,000 barrels, representing a total yield of about 2,000,000 barrels. Briefly this is the history of the apple industry, both in Ontario and Nova Scotia, the only provinces in Canada that have yielded a large surplus for export.

The phenomenal increase in the crop of Nova Scotia has been the result partly of increased plantings, but partly also of the better care which is taken of the orchards.

The increase in the acreage of new orchards in Ontario in the last ten years has probably been as great as in Nova Scotia, but these new orchards are not concentrated to the same extent. Nevertheless, they are by no means as widely distributed as the older orchards. As a matter of fact the decrease in the number of trees in the older smaller orchards in this province has been quite equal to the increase in the number of new trees planted in larger areas, and, perhaps, in more favorable situations. Modern orchard culture is also the rule in these new Ontario orchards. The outcome in both Nova Scotia and Ontario is a very large increase in the exportable surplus.

Recently there has been a marked change with reference to apple growing, brought about for the most part by coöperation. It is doubtful, indeed, whether orcharding can be recommended at all, unless it be for home use or for the local market, except where coöperative methods are used. Under the stimulus of such methods, growers are turning their attention to orcharding as a main source of income, where formerly it was only a side-line. The effect is to group the orchards in particular districts and to increase their size. It means, too, the application of business methods to this branch of horticulture. In modern phrase, orcharding is becoming "commercialized." The change is now taking place and we see the extraordinary spectacle of men in one part of a county receiving $2 per barrel for apples, while in the next township apples are being allowed to rot under the trees. The old order is passing away and the new is not yet thoroughly established.

At the present time the small grower, in neighborhoods where orcharding is not a special feature, would appear to have received a setback. A little more experience will show these small growers that it is quite possible, even in districts where apples are not a specialty, to organize coöperative selling associations so as to dispose of the fruit without difficulty and at a fair profit. It must be admitted that of late years the small orchard, as an adjunct to the farm, has not been remunerative. All attempts at growing four, five or half a dozen trees, which would be sufficient to supply the needs of the home, have failed; the trees are not numerous enough to receive proper care in the busy life of the ordinary mixed farm, and very quickly succumb to general neglect. Apparently the smallest area that can be recommended in general practice is five acres, and there is no reason why, with coöperative methods, there should not be a five-acre orchard on every farm in the apple districts. This would not interfere seriously with the larger interests of the farm, and yet would be sufficient to make it worth while to secure proper implements, spray at the right time and pay some attention to marketing. With the passing of these small orchards would go many of the pleasant recollections of farm life. The old orchard is the memory that lingers longest and links us most closely with the land. It would be worth while, merely as a partial solution of the depopulation problem, to institute a propaganda for a five-acre orchard on every farm.

The fact that the independent Canadian evolution of coöperation does not differ materially in methods from coöperation as practiced in the older lands, should inspire confidence in Canadians to accept more readily the teachings of pioneers in this system of conducting trade. Everyone who aspires to be useful in a coöperative way should acquaint himself with the history of coöperation in the older lands. Particularly valuable is the history of coöperation in Germany and Denmark, but scarcely less so are the recent developments in agricultural coöperation in Ireland under the leadership of Sir Horace Plunkett.

For general principles nothing can be better than the history of distributive coöperation in Great Britain.

I emphasize the importance of reading coöperative history for the reason that not all the Canadian apple selling associations have been successful. A careful study of the causes of their failure will show that in every case there has been a violation of some of the principles that are now regarded by those who have studied the subject, as fundamental to coöperation.

Perhaps the greatest mistake which fruit growers have made in reference to coöperation is to regard it as an isolated movement for the purpose of securing them a few dollars more than they would otherwise obtain. In its broader outlook coöperation is a friendly society or a benefit association. European coöperators have recognized this and have taken for their motto, "Each for all, and all for each." Taking this view, coöperation implies not only getting something that you did not have before, but also giving something or helping some one whom you could not otherwise help, and the giving or helping end is quite as important as the receiving end.

The prevailing system of marketing is founded upon competition, the practical motto of which is, "Every man for himself." The natural result of this is that a few individuals receive most of the prizes. C. R. Fay in *Coöperation at Home and Abroad* defines a coöperative society as "An association for the purpose of joint trading originating among the weak and conducted always in an unselfish spirit, on such terms that all who are prepared to assume the duties of membership may share in its rewards in proportion to the degree in which they make use of their association."

The late Chief of the Fruit Division of Canada, A. McMeil, Esq., said:—"It will be necessary, in the course of what follows, to point out some of the evils of the ordinary competitive system in connection with the apple industry, and in doing so it must be definitely understood that individual growers and buyers cannot be held altogether responsible for the disabilities under which the apple industry undoubtedly labors. It is the system under which they are working that is most at fault. It offers at every turn incentives to untruthfulness and misrepresentation. It places in the hands of unscrupulous growers and unscrupulous buyers an effective instrument of fraud and renders it more difficult for honest men to conduct a legitimate business. Indeed this fraud in the apple business became so serious in Canada that it necessitated the passing of the Fruit Marks Act, now merged in the Inspection and Sale Act, which has done much to correct some of the grosser evils."

The aim of coöperation is to bring fruit products as directly as possible from producer to consumer.

To encourage the best methods of production.

To encourage honesty in grading and packing fruit.

To enable a number of small growers to establish a commercial standing.

Coöperation does not exist enduringly without friendship, mutual devotion, and faithfulness.

When taking up the coöperative movement in Nova Scotia it was a very common remark that farmers or fruit growers would not work together to accomplish anything. But the Annapolis Valley farmers have shown very clearly that such is not the case with them.

This coöperative movement was organized in the year 1907 by a few of the most up-to-date fruit growers in the town of Berwick, right in the heart of the fruit producing district. The method of handling the fruit product prior to this date was not in the best interests of the fruit growers, consequently not appreciated by them.

The European commission houses had their agents stationed all through the fruit district during the shipping season. Their agents had sub-agents at nearly every railway station.

The farmer would pack his apples at home and on an appointed day would haul them to the station where the sub-agent would make up a carload and forward it according to his immediate superior's orders. Then an array of charges began piling up, really startling in their ingenuity.

In 1907 a few of the most up-to-date and energetic farmers in Berwick made up their minds, however, that in coöperation alone was to be found a cure for the state of affairs which then existed. The product of their orchards was increasing year by year and they realized that there were only two ways in which they could give proper attention to the packing and grading of their fruit.

The first was to individually build packing houses on their own farms large enough to permit of fruit being stored and packed, the second, to get together and build or buy a large warehouse on the line of railway where the fruit of all could be stored and packed by experts.

The latter was the scheme that appeared most attractive and these men formed the first Coöperative Fruit Company in Nova Scotia. This company was called the Berwick Fruit Company and was incorporated under the Nova Scotia Joint Stock Companies Act, with an authorized capital of $10,000.00. Warehouse accommodation was secured and during the first season some 7,000 barrels of apples were handled. The leaders of this movement soon found that one of the most important factors in successful coöperative fruit packing was the production of good fruit. The company, therefore, used its best influence to educate its members in the matter of careful cultivation, spraying, etc. At the beginning of the next season, the membership was doubled and a new warehouse was purchased. In 1908 the output was 15,000 barrels and 1909, 22,000 barrels.

In this way the coöperative movement went forward by leaps and bounds. I will not follow it through all its varied stages but simply say that in 1912, what is known as the United Fruit Companies of Nova Scotia Limited, was formed. This company was incorporated with an authorized capital of $50,000.00, of which $42,000.00 was subscribed. Each subsidiary company subscribed 20% of its authorized capital. The membership of this company is about 1,700. The aim of the United Fruit Companies is to establish and maintain a uniform and high standard pack. Great importance is attached to this matter of good pack.

The United Fruit Companies purchase their supplies, such as fertilizer, seeds, flour and feed direct from the producer and in this way the consumer gets his goods at first cost. Very many more things might be said in reference to the coöperative movement in the far famed Annapolis Valley. Some of these may come to the surface if this short paper is discussed.

SELLING APPLES.

Mr. John C. Orcutt, Secretary Committee on Agriculture, Boston Chamber of Commerce.

For years the grower has been studying and working to improve his methods and his product. Lectures, discussions, books and bulletins have dealt with nearly every phase of the problem but "Selling the Product." "Selling Apples" has always been of great importance to the grower, but until recently it has not been given very much thought, study or attention. The speaker does not come here as an authority on the selling of apples, as he realizes that he knows very little about the subject as a whole, but to give you the conclusions he has reached from some little experience, study and observation.

CLASSES OF GROWERS.

Growers may be divided into three classes:

1. The grower whose fruit is his main crop and income, who takes care of his orchards and packs his fruit in a systematic manner.

2. The grower whose fruit is a side issue, who takes care of his orchards and packs his fruit in the best manner he knows how.

3. The grower whose fruit is a side issue, who takes no care of his orchards and packs in no systematic way.

Large and small growers of all these classes are found in nearly every section of New England. Because of these facts and while it is the desire of all growers to sell their product for as much as possible, it is evident that all the product of any one section cannot be sold in the same way or sent to the same market and have the results satisfactory to all.

AVAILABLE MARKETS.

There are two principal markets for apples, the local market and the outside market. *The local market* is the growers' immediate vicinity. There are generally four ways in each of these local markets to sell your product. First, direct to the consumer; second, to the small retailer who sells in that vicinity; third, to the local buyer who buys for himself or some wholesale firm, and fourth, to the traveling buyer of wholesale houses.

The outside market is in the large towns and small cities, outside of the growers' immediate vicinity, and the large cities that are distributing points for local and foreign demands. This outside market affords three principal ways of marketing: First, selling direct to retailer; second, to general commission men; and third, to large wholesale commission men.

All of these markets are open to the growers of apples in New England, and it is up to the grower to decide which one he will take advantage of. The growers have been putting much energy into producing their product and have for the most part paid little attention to finding a market for their product but have expected the market to come to them. The buyers and commission men have found the market and come to the grower. Mr. E. C. Simmonds, president of the Simmonds Hardware Company of St. Louis, the manufacturers of the Keen Kutter line of goods, says that he built up the annual business of $20,000,000 by nine parts of salesmanship and one part of general management. The fruit grower and also the farmer have been taught for many years that it was a great thing to make two blades of grass grow where one grew before, and to this end they have been putting in nine parts of their time and energy, and only one part into selling. All are agreed that it is a great thing to make two blades grow where one grew before, but some think that it is quite a stunt to sell the one that already grows for a fair profit.

PRINCIPLES GROWERS SHOULD OBSERVE.

The fundamental principles in the selling of apples are:

1st. Planning ahead.

2nd. Understanding the ways of marketing, who the buyers are in these markets, and what these buyers want.

3rd. Having a knowledge of salesmanship and finance to handle the product.

Planning ahead. Each grower if he wants to get the most money out of his product must be planning ahead. This does not mean just for next season's crop, but you have got to work and plan, every week, for fifty-two weeks in the year and every year. It is the net results that count. The grower should all the time be looking up and learning all about the buyers, markets and their conditions, become acquainted with as many as possible, and plan out how he can make conditions so that he can put up some good arguments why his fruit should be sold for a good price.

Understanding the ways of marketing. The grower should thoroughly understand the various ways of marketing,—first in his local market, how many consumers there are who would buy direct, to whom he can easily deliver and how much they will buy, who are the retailers and how much they will buy, who are the local buyers and how many buyers from outside commission firms are likely to be in the vicinity. Inquire from other growers how they sell and to whom they sell. Second, in the outside market, make the same study of who and where the large retail and wholesale buyers are, and how they handle apples, the varieties, the package, commission and storage rates.

Having a knowledge of salesmanship and finance to handle your product. To successfully plan ahead, look up markets and hold apples in cold storage, takes money, and time, which is just the same as money,—so does the studying up of selling plans and the getting out of literature to advertise your product. Each individual grower must decide according to the importance of his crop as to how much planning, time and money he can put into this work.

HOW TO GET IN TOUCH WITH THE MARKETS AND THE BUYERS.

Each grower in his local section can get in touch with the buyers by expending some time and a little energy. The outside market is a little more difficult to get in touch with, but I am sure the Boston Chamber of Commerce and your own State Board of Agriculture will be only too glad to furnish you with a list of buyers in the large markets. There are some growers who have gotten in touch with large retailers in Boston, and working together the growers are marketing part of their fruit. This is a good way but can only be used to a limited extent, as the majority of retailers do not want to buy of the grower because they do not know the grower, his brands or reputation. These retailers want to buy from day to day from a wholesaler who will furnish them just what they want when they want it, adjust any claims for poor and damaged fruit and at times extend them credit. There are a large number of general commission men who handle more or less apples; some buy outright of the owner and others handle on consignment only. The growers have found a great deal of fault in this way of doing business, claiming the commission men do not give them a square deal, for they read in the paper that apples were quoted $4.00 per bbl. and in going through Quincy Market, a dealer told them he asked $5.00 a bbl. and they had only received $2.50 return from the commission man they had shipped to a week previous. So the grower immediately concludes the commission man charged him an enormous profit. The grower did not understand that his shipment was a small one, the commission man did not know in advance the kind or quantity of the apples, or that he was to receive any at all, so he had no time to work up a market, but as the grower wanted his money right off he had to sell at what he could get. Then on a small quantity the overhead charges are very high.

If the grower has small lots of apples which he wishes to sell through a commission man, the best thing he can do is to go to the nearest large town or city, look up some commission man, become acquainted with this man, and work with him to dispose of his apples. This generally is very satisfactory. If not, find another man to deal with, but the grower must always remember that if he does not look out for his interests, nobody else will. The same method applies to the selling of apples to the wholesale commission men, who handle the bulk of the apples. Know what you are going to have to sell, then get in touch with some wholesaler and work together in grading, advertising and marketing your fruit. You can easily obtain the names of large dealers. Every grower should keep a checking account in his nearest national bank or trust company. This will bring you to know the bank and the bank to know you. They can help you to look up any dealer you wish and will undoubtedly be glad to. After looking up your dealer, call upon him and go over the matter of handling your apples, and I do not believe but that you both can obtain satisfactory results.

It must be kept in mind that if a buyer pays you cash for your apples it will necessarily be less than the present market price less regular commission rates of say 20 cents per bbl., because the man who takes the risk must make more than a regular commission profit. A quantity of apples can be handled cheaper than a few barrels. *This is where coöperation comes in, if the growers of any one section can combine and decide to grade and sell their apples together. Get in touch with the local banker, some good wholesale commission house, and all pull together.* In a few years a very profitable market can be worked up.

Right here in Maine you have a good example of a coöperative society, which has been steadily at work for the last four or five years and has made a good success, the Oxford Bears Fruit Growers' Association of Buckfield. They have established a brand name and that with a good pack of fruit is the most important asset in selling.

I realize that on account of the various conditions which exist in the different sections, it is hard to do this. *But you must realize that the more you go out to the market, the more net money you will receive, and as long as you let the market come to you the less money you can expect to receive.* And lastly, we cannot get rich in one season, and we must have time, energy and patience to accomplish lasting results.

I believe one of the most fundamental things for the growers to do is to get in touch with the way apples are marketed in the large cities and the people who are handling them and the different grades and markings for apples. This I think will be a help to all and eliminate much of the misunderstanding that now exists. I am sure the committee on agriculture of the Boston Chamber of Commerce will be very glad to help you get in touch with these markets, buyers and conditions.

CONCLUSIONS.

The large attendance at all of the meetings held in Auburn was especially gratifying to those in charge, but satisfactory as that factor was, the enthusiasm which developed was still the most encouraging feature of the meeting. The fact that a register kept at the door had 280 names enrolled at the end of the meeting and the additional record in that book that growers who registered owned an aggregate of practically 135,000 fruit trees, are figures that are significant of the success of this convention.

The supper held on the second evening of the convention added a striking tone to the whole affair and will be long remembered by those who were fortunate enough to gain a seat at the tables.

The eastern meeting at Bangor was not expected to be such a rousing meeting as the one at Auburn, because of the less general interest in orcharding in that section. The registration reached 46 at the close of the sessions and the growers present represented some 38,000 apple trees. The enthusiasm ran high at this meeting as well as at Auburn and the interest manifested in orchard work in this section of the state was noted with especial interest by the speakers who were visiting new territory.

Much credit should be given to the different individuals and committees who made possible these two rousing meetings for better fruit in Maine.

The Bureau of Horticulture, as the instrument from Augusta, wish to express the appreciation they feel for the ardent coöperation which was given by the Auburn Fruit Growers' Association, the Auburn Board of Trade and the Bangor Chamber of Commerce in their efforts which have made possible the successful establishing of a new feature in arousing greater enthusiasm and greater possibilities in fruit growing in the State of Maine.

Potato Inspection.

Powdery Scab (Spongospora Subterranea) in Maine.

PRELIMINARY INVESTIGATION.

On January 15, 1914, Dr. Woods of the Experiment Station at Orono notified this department that an outbreak of powdery scab had been discovered in Maine. The source of infection was given as Gardiner in the seed stock of I. H. Ware. Dr. Woods suggested that Dr. Morse of the station and the writer from the department visit Mr. Ware and find whatever information was available concerning the origin of the stock. He also suggested that means of eradication be studied to prevent further spread.

We visited Mr. Ware at his home at Spear's Corner a short time afterward. From Dr. Morse, I found that scab had been reported by Dr. Melhus who was in charge of the government operations in Houlton and is now located at Caribou. The infection reported by Dr. Melhus originated at Presque Isle, but at that time Dr. Morse did not know the name of the grower owning the stock.

Mr. Ware had sent samples of seed, which he had obtained from Hoyt & Wheeler of Presque Isle, to the Department of Agriculture to find out if they were typical Cobblers. He received notice that the specimens which he had sent in had some spots of powdery scab upon them. He then sent specimens to Orono and without knowing that the government had found such scab, they likewise notified him that the seed was infected. This occurred at the time Dr. Morse was in Washington attending a hearing, but on his return he corroborated the finding of Mr. Shapovalov. It was found through Mr. Ware that these potatoes had been obtained from Hoyt & Wheeler who in turn had obtained them from a man unknown to Mr. Ware, also living in Presque Isle. Upon inspection of the remainder of the barrel from which the infected stock had been obtained, Dr. Morse discovered many specimens of powdery scab. Potatoes grown upon his own land from a cursory examination were clean.

We then went to Presque Isle and interviewed Mr. Hoyt for further particulars in regard to the origin of the infected seed. From him we found that the potatoes came from Mr. C. P. Stone of that town who had purchased them in Portland in 1911 and that they were a part of a shipment from Ireland. Mr. Stone planted them first in 1911 and sold his output to Hoyt & Wheeler in 1912. In 1913 they planted nineteen acres and obtained the remarkable yield of 3807 barrels, according to their sworn statement. All but 1200 barrels had been sold, as the demand had been very great. It seemed an easy matter to stamp out this disease at that time.

The second indication that powdery scab existed in Maine became apparent when on Feb. 3, a telegram was received from Dr. Marlatt, Chairman of the Federal Horticultural Board, stating that Mr. J. B. Daggett, Minister of Agriculture in New Brunswick, had through his inspectors discovered powdery scab in potatoes loaded at St. Hilaire and Grand Falls, New Brunswick, brought over from the American side and shipped in bond to points in America. A second telegram stated that Dr. Melhus would handle the government investigations and asked for the coöperation of the State Department. Dr. Melhus of the Federal Department, Dr. Morse of the Experiment Station, Mr. Adams, a senior at the University of Maine, and the writer, began the investigation at Washburn on February 9. The potato houses were visited there and scab was found in about half of the bins in considerable quantity. Other towns were visited and the condition of the stock examined. It was soon evident that powdery scab existed in quantity and that the situation was extremely serious for the growers. Mr. Petty, Mr. Morse, and Mr. Peasley, all from the college at Orono, and Mr. Jones of China were added to the inspection force in order to complete the survey at the earliest moment. Only the potato houses along the railroad were visited, partly because of the inclemency of the weather and partly because of the lack of sufficient force.

The following table is a summary of the preliminary investigations:

Town.	†Scab.	Clean.
Washburn	750	880
Ft. Kent	850	8,000
Soldier Pond	850	15,350
Frenchville	1,460	8,300
Grand Isle	2,100	10,550
Littleton	1,750	7,340
Houlton	400	23,390
Limestone	1,610	29,425
Caribou	9,700	39,500
Squa Pan	1,100	7,300
Ashland	3,250	14,950
Van Buren	1,110	14,000
Danforth	100	2,760
Kingman		3,620
Oakfield		6,275
Dyer Brook	1,725	6,945
Presque Isle	7,775	27,925
Ft. Fairfield	4,725	18,900
Mapleton	2,725	5,850

Monticello	350	18,000
*Easton		
*Mars Hill		
	42,330	269,260

The greatest infection was found along the St. John river and in the sections around Caribou, Presque Isle and Ashland. The infection around Houlton was so small that it appeared that the southern limit had been found. Later on, however, this disease was found as far south as Patten, a border town in Penobscot County. The Bliss and Cobbler varieties appeared to be very subject to this disease, while the Green Mountains were more or less immune.

In some cases the source was without doubt of foreign origin, but it was plainly evident that the greater part of the powdery scab had been introduced from New Brunswick. In one county in New Brunswick it was stated that the infection had reached the alarming percentage of eighty-five and appeared to be on the increase.

It would appear to the writer that powdery scab has been present in Aroostook county for a period ranging from five to fifteen years, inasmuch as the seed on certain farms had not been changed within those limits. Of course there is the possibility that the disease was introduced by other means, but there is very little evidence that such is the case. The fact that the infection has not gained greater headway up to this time may be due to the systematic rotation of crops so largely practiced in Aroostook county. The infection was too general to bear out the theory that this disease has been introduced from New Brunswick within two or three years.

OPPOSITION TO FEDERAL QUARANTINE.

It was plainly evident that unless the state with the support of the Aroostook growers and dealers made an active effort to handle the situation in a satisfactory manner an embargo would be placed on Maine potatoes by the Federal Horticultural Board.

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†More or less scab present in bins. Not all scabby.

*No record kept.

The word "quarantine" at that time assumed gigantic proportions and it was feared that the seed trade with other states would be ruined if such action was taken on the part of the Government. In some cases it was believed that such an action would mean the retention of all potatoes within the state.

A meeting was called in Houlton soon after the preliminary investigation on the part of the state and federal authorities and many of the dealers and growers were on hand. It was decided to ask the Governor and Council to send delegates to the public hearing held in Washington, and that these delegates be authorized to state the position of the state in the matter and urge that the Department of Agriculture of Maine be allowed to handle the situation for the present season, and that the Governor and Council endow the Commissioner of Agriculture with the necessary authority.

The Governor and Council agreed to take such action as was necessary and appointed delegates for the hearing.

RESULT OF INFORMAL HEARING IN WASHINGTON, D. C.

At this meeting were Commissioner John A. Roberts, William A. Martin of Houlton and Dr. Woods of the Experiment Station as representatives from the State of Maine, also Senators Charles F. Johnson and Edwin C. Burleigh, Representatives John A. Peters and Frank E. Guernsey, Mr. George E. Wicks, general freight agent of the Bangor and Aroostook Railroad, and Major E. E. Philbrook of this department.

The situation was carefully gone over with the result that for the time it seemed best to leave the control of the potato situation to the State of Maine, with experts from the Department of Agriculture to assist in an advisory capacity. The following plan of action was agreed to by the Maine authorities and by the representatives of the railroads:

RAILROADS.

1. To agree definitely to accept for carriage only potatoes that are certified by the proper authorities of Maine.

2. To report daily to the Commissioner of Agriculture of Maine and the Federal Horticultural Board of Washington the origin, the car number, and the destination of the car, indicating whether the potatoes are for seed or for table purposes.

3. In case knowledge comes to the railroad later of any diversion as to the destination of these cars, both the Commissioner of Agriculture of Maine and the Federal Horticultural Board shall be notified as soon as that information comes to their knowledge.

4. The railroads are to load potatoes only from regular potato houses and not directly from vehicles.

INSPECTION.

The State of Maine will inspect all potatoes for shipment at the warehouses.

CERTIFICATION.

Certify as seed potatoes only such as are believed, as a result of inspection, to be free from powdery scab or from contamination with powdery scab. All seed potatoes to be shipped in sacks, with label showing number of certificate to be attached to each sack.

All potatoes under any suspicion of contamination will be certified for table stock only, and no potatoes infected with powdery scab will be certified for shipment out of the state.

CONTROL OF DISPOSITION OF TABLE STOCK POTATOES.

Reasonable effort will be made by the Maine authorities to secure the disposal of possibly contaminated potatoes at such centers of consumption as will eliminate as far as possible the use of such potatoes for seed stock.

INSPECTION.

As soon as it was decided for the state to undertake the work of inspection, it was necessary to organize and train a sufficient corps of inspectors. These men were appointed in the main from Aroostook county, partly because of their experience in the potato business, and partly because they were on the ground ready for work. Each man was well recommended by some dealer or grower of standing. In order to get the type of men necessary we guaranteed a wage of three dollars per day. It was necessary to go from town to town, get together a group of applicants and show them the distinguishing features between powdery scab and other kinds. By the end of the first week in March, most of the men had become very proficient in distinguishing this disease.

Office room was obtained in Presque Isle in the office of the American Potato Company.

Official inspection began on March 9, with eighty-five inspectors on the work. The territory was divided into sections, with a division chief for each section. Mr. E. C. Leach was director of the Houlton division, which included all the stations from Patten and Sherman to and including Monticello. Mr. C. A. Jones had charge of the Fort Kent division, which took in the towns between Fort Kent and Squa Pan, also the towns between Fort Kent and Van Buren, including Van Buren Mr. L. E. Tuttle had charge of the Caribou division, which included the towns between Caribou and Van Buren, Caribou and Limestone, and Caribou and New Sweden on the Aroostook Valley Railroad. The remainder of the territory was handled from the main office at Presque Isle, and most of the time under the direction of E. F. Grenier. Mr. H. F. Day was appointed clerk in the office. Each of these men had his work cut out for him during the early part of the inspection, not only in making the local inspection efficient, but in overcoming the antagonism on the part of the producers as well.

INSPECTION FEE.

The state was not in a position to bear the expense of inspection as no funds were available for that purpose, consequently it was necessary to charge an inspection fee for each car certified. After estimating about what the expenses would be and the probable number of cars to be shipped, it was decided that the inspection fee should be two dollars per car, or slightly less than one cent per barrel.

CERTIFICATES.

Books were issued with the certificates in triplicate, one certificate to be issued to the consignor, one to the transportation company and one for the department. Two sets of books were issued, one for seed certificates and the other for table stock certificates, the former containing twenty-five certificates and the latter fifty. Each book was numbered consecutively, so that each car certified had a different number. Seed books were numbered and lettered to distinguish them from table stock books. These certificates were issued to the shipper after the stock had been duly certified and upon the receipt of the inspection fee. At the end of each week each inspector forwarded to the office such certificates as had been issued by him during the week and the accompanying fees.

TAGS.

All seed stock had to be bagged and tagged. Tags stated that the potatoes in the package had been duly inspected and were apparently free from powdery scab or from contamination with the disease, and each tag bore the number and letter issued upon the particular certificate for that car. Tags could not be procured in quantity at the time inspection began and two weeks were allowed for the shippers to obtain them.

LOADING POINTS.

Inspectors were placed at practically all points where there were potato houses and in some of the larger towns there were from three to five inspectors. At some of the smaller shipping points it was impossible to keep an inspector all of the time and in such cases inspection could be obtained by notifying the chief of the division. One of the early regulations prevented the shipment of potatoes from those points where there was no potato house; that is, at those points where there was only a loading platform or wharf. This injured certain of the shippers in that they had to haul a much longer distance and the regulation was later altered to better meet the situation.

INSTRUCTION TO INSPECTORS.

1. The infected area at present covers Patten, Sherman, and all stations in Aroostook County north of Sherman.

2. All potatoes for shipment outside of infected area must be carefully inspected before loading on the car. This includes table stock as well as seed stock, and all scab must be racked out.

3. If powdery scab is found in any part of a shipment, the stock must be condemned for seed purposes. Such potatoes must be racked and if free from scab of any kind, may be certificated as table stock.

4. All seed stock must be apparently free from powdery scab and must not be taken from bins, loads or lots of potatoes in which powdery scab has been found. No potatoes from bins, loads or lots in which powdery scab has been found shall be certificated for shipment as seed.

5. Seed stock infected with common scab or Rhizoctonia should be racked to remove all potatoes affected with these diseases.

6. In case of table potatoes presented for inspection in packages, at least one average package in ten, taken from different parts of the load or lot, must be emptied out and the potatoes thoroughly inspected.

7. In case of seed potatoes presented for shipment in packages, one average package in five must be emptied out and thoroughly inspected, and the inspector must know that such potatoes have not been liable to contamination.

8. The railroads are to load potatoes only from regular potato houses and not directly from vehicles,—*except* a shipper may obtain a permit to load otherwise from inspector, who shall notify railroad agent where cars may be set.

When certificate has been issued to party who has been granted permit to load outside of a regular potato house, the inspector shall state on back of copy of certificate sent to our office:

1. Reason for granting the permit.
2. The method used in loading car.
3. The method of inspection.

9. All seed potatoes are to be shipped in sacks and each sack is to be labelled, and the label should bear a printed certificate of state inspection and number of car certificate of inspection.

Inspectors will furnish Mr. Gardner of this office the name and address of each grower whose potatoes have been found infected with powdery scab.

CERTIFICATION.

1. Each inspector must be provided with:
   (a) A seed certificate book.
   (b) A table stock book.
   (c) A card of identification.

2. When satisfied that a shipment is free from scab the inspector may issue certificate for table or seed stock as the case may be.

3. The inspector shall fill out the blank certificate according to information called for in the form, together with the date of issue, and shall sign his name to each certificate.

4. The certificate shall be issued only upon receipt of the required fee, two dollars.

5. The certificates are issued in triplicate. One copy shall be kept by the inspector to be turned into this office, and the other two copies shall be given to the shipper, one of which he will give to the transportation company at the time of billing.

6. One copy of each certificate issued (white) shall be sent to A. K. Gardner at Presque Isle, at least once each week (preferably on Monday), and shall be accompanied by the fee collected on that certificate.

7. If a certificate is spoiled, all three copies shall be sent to the office at Presque Isle.

8. When possible shippers should pay fees by check; these checks should be made payable to John A. Roberts, Commissioner.

9. Inspectors are responsible for all blank certificates furnished them at the rate of $2.00 for each set of three, but will be given credit for all returned to the office at the same rate.

J. A. ROBERTS,
Commissioner of Agriculture.

Augusta, March 12, 1914.

PAYMENT OF INSPECTORS.

All money received for inspection was forwarded to this office and deposited to the credit of the Bureau of Horticulture. Pay rolls were made up every two weeks and paid when approved by the State Auditor.

INFECTED FARMS.

Each inspector was required to keep a memorandum of the lots of potatoes infected with powdery scab and to find out where such stock was grown. The list of farms so infected is on file in this office.

CAR SHIPMENTS.

The following tables are compilations of the cars certified by inspectors from March 9 until July 1. The first table shows the total number of cars shipped, the station from which they were billed and the inspecting officer. The second table shows the number of full car shipments and the number of part car shipments from each town and the inspecting officer.

From Table 1 it will be seen that Caribou was the heaviest shipping point during the inspection period. The total shipment from this town was 721 cars and the average for the first three weeks was 86 and a fraction cars per week. Second to Caribou was Fort Fairfield, with 623 cars. Then followed Houlton with 530, Easton 520, Mars Hill 489, Presque Isle 486, Monticello 339, and Fort Kent 336.

The largest number of cars shipped in one week was 957 for the week ending March 21, or the second week of inspection. The manner in which shipments held up throughout the season was remarkable, as it may be noted that for the week ending June 20, 285 cars were shipped. The total shipment for the season was 9,822 or an average of about 614 cars per week for sixteen weeks.

TABLE I. MAINE DEPARTMENT OF AGRICULTURE POTATO INSPECTION.

TOTAL CAR SHIPMENTS DURING INSPECTION PERIOD.

March.			April.				May.					June.				Total cars.		Town.	Inspector.
14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27				
10	5	4	9	11	1	9	8	3	18	18	19	15	–	–	–	130	–	Patten	Ingraham.
10	10	7	17	10	12	24	15	20	12	16	8	–	–	–	–	161	–	Sherman	Grant.
11	10	3	10	14	6	14	8	2	6	23	–	–	–	–	–	107	–	Crystal	Tabor.
2	3	5	3	5	4	8	6	5	7	11	12	10	16	8	–	105	–	Island Falls	Estabrook.
8	4	9	11	11	3	16	10	4	–	–	–	–	–	–	–	76	–	Dyer Brook	White.
10	11	9	9	14	6	11	6	2	–	–	–	–	–	–	–	78	–	Smyrna Mills	Smith.
–	–	–	–	–	–	–	–	–	–	–	12	–	3	–	–	15	–	Smyrna Mills	Tabor.
9	10	7	5	11	6	10	14	5	8	7	11	13	–	–	–	116		Ludlow and New Limerick	Gorham.
																	93		
7	6	2	8	6	6	8	7	3	–	19	–	–	–	–	–	72	–	Cary's Mills	Crosby.
8	11	8	6	13	8	14	12	11	–	–	–	–	–	–	–	91	–	Houlton	Lovett.
8	11	12	7	–	17	15	15	3	12	11	13	–	–	–	–	124	–	Houlton	Cleveland.
24	24	15	15	16	8	–	–	–	–	–	–	–	–	–	–	102	–	Houlton	Titcomb.
18	17	23	–	–	–	–	–	–	–	–	–	–	–	–	–	58	–	Houlton	Small.
–	–	–	20	23	11	21	9	9	–	–	–	–	–	–	–	93	–	Houlton	McCormick.
–	–	–	–	–	–	–	–	–	8	10	–	20	9	4	11	62	–	Houlton	Leach.
																	530		
12	17	9	13	13	8	14	9	13	11	11	18	19	29	26	6	228	–	Littleton	McNutt.
25	20	17	20	12	11	13	21	13	21	13	2	–	–	–	–	188	–	Monticello	Tingley.
6	3	5	2	–	15	–	–	–	–	–	–	–	–	–	–	31	–	Monticello	Bubar.
–	–	–	–	–	–	–	–	–	–	–	10	31	51	30	–	122	–	Monticello	McCormick.
																	339		
18	21	15	13	12	10	12	16	–	–	–	–	–	–	–	–	117	–	Bridgewater	Whited.
–	–	–	–	12	13	13	11	12	20	9	13	16	21	15	–	155	–	Bridgewater	York.
																	272		
10	9	13	13	10	8	11	13	6	6	1	–	–	–	–	–	100	–	Robinson	Robinson.
20	15	16	22	12	11	16	13	9	14	15	20	12	17	10	3	225	–	Mars Hill	Sylvester, F.
19	21	26	22	18	12	17	13	13	11	30	18	17	16	11	–	264	–	Mars Hill	Sylvester, V.
																	489		
11	37	21	20	14	14	16	13	9	9	7	–	–	–	–	–	171	–	Westfield	Chase, C.
1	4	9	11	–	–	–	–	–	–	–	–	–	–	–	–	25	–	Phair	York.
16	16	19	37	30	16	33	27	17	23	29	22	32	29	17	19	382	–	Easton	Adams.
32	29	18	20	–	–	–	–	–	–	–	–	–	–	–	–	99	–	Easton	Hoyt, E.
–	–	–	–	15	24	–	–	–	–	–	–	–	–	–	–	39	–	Easton	Grenier.
																	520		

TABLE I—Continued.

March.			April.				May.					June.				Total cars.		Town.	Inspector.
14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27				
17	19	19	12	-	-	-	-	-	-	-	-	-	-	-	-	67	-	Fairmount	Hoyt, H.
-	-	-	-	19	13	14	11	7	6	5	6	7	6	9	2	105	172	Fairmount	Hoyt, E.
10	12	22	15	22	16	11	12	3	3	6	5	5	9	8	2	161	-	Maple Grove	Orser.
5	11	11	15	13	7	11	7	-	-	-	-	-	-	-	-	80	-	McShea	Ginn.
-	-	-	-	-	-	-	-	21	13	11	4	9	15	15	3	91	-	Ft. Fairfield	Ginn.
20	22	17	14	9	3	7	9	-	-	-	-	-	-	-	-	101	-	Ft. Fairfield	McDonald.
23	30	41	28	29	23	23	16	-	-	-	-	-	-	-	-	213	-	Ft. Fairfield	Kinney.
12	10	9	12	4	3	4	6	19	27	10	-	-	-	-	-	116	-	Ft. Fairfield	Kipp.
-	-	-	-	-	-	-	-	11	12	5	15	12	28	15	4	102	623	Ft. Fairfield	Rollins.
3	6	9	3	6	2	6	5	-	-	-	-	-	-	-	-	40	-	Stevensville	Rollins.
6	7	7	4	3	4	4	2	5	-	-	-	-	-	-	-	42	-	Walton Siding	Maines.
-	1	4	5	-	-	-	-	-	-	-	-	-	-	-	-	10	-	East Linton	Conant.
3	5	8	13	5	6	8	5	12	9	10	27	25	35	23	-	194	-	Presque Isle	Greenwood.
9	11	7	6	7	5	-	-	-	-	-	-	-	-	-	-	45	-	Presque Isle	Perry.
17	14	17	16	8	6	14	8	8	8	8	-	-	-	-	-	124	-	Presque Isle	Brewer.
4	12	6	13	10	8	8	4	-	-	-	-	-	-	-	-	65	-	Presque Isle	Jacobs.
10	10	-	5	-	2	-	-	-	-	-	-	-	-	-	-	27	-	Presque Isle	Hardy.
3	1	-	6	-	-	-	-	-	-	3	-	-	-	-	-	13	-	Presque Isle	Grenier.
-	-	-	-	-	-	2	1	-	-	1	2	1	-	3	2	12	-	Presque Isle	Day.
-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	4	6	486	Presque Isle	Jones.
3	12	7	12	3	8	13	15	8	7	7	7	-	-	-	-	102	-	Guiou's Siding	Guiou.
13	23	17	16	8	7	15	15	13	16	8	12	16	18	10	-	207	-	P. I.—Washburn	Rolfe.
4	6	6	8	6	7	8	4	8	-	-	-	-	-	-	-	57	-	Bean and Scott	Gilpatrick.
5	2	3	4	3	1	1	-	-	-	-	-	-	-	-	-	19	-	Maysville	Rhodes.
6	6	3	6	8	7	6	-	-	-	-	-	-	-	-	-	42	-	Mapleton	Phair.
4	6	3	7	4	5	7	9	4	-	-	-	-	-	-	-	49	-	Mapleton	Hemphill.
-	-	-	-	-	-	-	-	-	-	-	9	8	10	2	-	29	120	Mapleton	Barker.
6	11	7	7	9	8	8	6	5	9	11	-	-	-	-	-	87	-	State Road	Barker.
9	19	19	5	12	6	7	10	3	10	8	11	9	23	7	-	158	-	Washburn	Stoddard.
7	10	13	5	2	5	9	5	3	5	1	5	4	4	2	-	80	-	Perham	Oliver.
18	7	12	8	7	4	8	4	10	6	26	14	-	-	-	-	124	-	Sweden, A. V. R	Mills.
13	20	28	7	12	11	8	7	8	-	4	-	-	-	-	-	118	-	Woodland Center	Parsons.
12	17	18	15	6	8	8	4	3	-	-	-	-	-	-	-	91	-	McGraw's Siding	Irvine.

11	22	15	31	18	17	27	10	14	26	11	27	36	42	15	2	324	–	Caribou	McIntire.
7	14	10	5	7	5	8	4	7	–	–	–	–	–	–	–	67	–	Caribou	Sampson.
20	27	39	–	9	13	23	17	–	–	–	–	–	–	–	–	148	–	Caribou	Thomas.
44	24	26	20	20	9	–	–	–	–	–	–	–	–	–	–	143	–	Caribou	Hardison.
–	–	–	–	–	–	–	–	–	7	3	3	13	11	2	–	39	–	Caribou	Tuttle.
																	721		
21	14	16	20	18	10	18	10	13	12	9	8	3	20	9	1	202	–	Murphy Road	Hale
20	24	21	23	28	22	22	16	9	–	–	–	–	–	–	–	185	–	East Road	Stetson
34	35	29	36	26	16	22	14	5	18	13	20	13	24	16	1	322	–	Limestone	Chase, H.
25	22	30	19	33	19	22	19	12	15	29	16	24	21	13	9	328	–	Limestone	Chase, W.
3	4	6	5	4	6	5	2	2	–	–	–	–	–	–	–	37	–	Ogren	Todd
10	11	9	14	12	9	8	7	7	10	9	8	9	8	–	–	131	–	New Sweden	Erickson.
2	3	2	6	4	4	–	–	–	–	–	–	–	–	–	–	21	–	Jemtland	Larsson.
6	4	7	4	–	–	–	–	–	–	–	–	–	–	–	–	21	–	Stockholm	Anderson.
–	–	–	–	4	5	–	–	11	4	4	4	5	2	–	–	39	–	Stockholm	Peterson.
																	60		
11	10	4	10	8	9	12	12	8	–	–	–	–	–	–	–	84	–	Van Buren	Hammond.
14	9	13	11	10	7	18	11	9	8	9	5	1	4	–	–	129	–	Van Buren	Theriault.
–	8	13	7	20	10	–	–	–	–	–	–	–	–	–	–	58	–	Van Buren	Cleary.
																	271		
–	4	3	8	2	2	–	3	–	1	–	–	–	–	–	–	23	–	Grand Falls	Pirie.
3	16	18	19	18	9	16	14	3	9	6	4	3	8	1	1	148	–	Grand Isle	Soucy.
8	11	14	10	9	7	5	5	1	–	–	–	–	–	–	–	70	–	Madawaska	Pelletier, J.
16	14	11	16	22	17	26	26	8	14	30	14	21	9	–	–	244	–	Frenchville	Bouchard.
4	10	14	7	–	–	–	–	–	–	–	–	–	–	–	–	35	–	Frenchville	Pelletier, F.
																	279		
5	10	5	9	8	11	8	5	–	–	–	–	–	–	–	–	61	–	Ft. Kent	Daigle.
9	9	8	9	13	8	17	6	7	15	26	16	19	32	14	–	208	–	Ft. Kent	Dufour.
–	–	–	–	8	8	13	7	8	6	–	–	–	–	–	–	50	–	Ft. Kent	Bradbury.
–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	2	–	Ft. Kent	Jones.
–	–	–	–	–	–	–	–	–	–	–	–	6	6	–	3	15	–	Ft. Kent	Grenier.
																	336		
6	8	13	9	7	5	9	11	–	–	–	–	–	–	–	–	68	–	Soldier Pond	Michaud.
–	–	–	–	–	–	–	–	12	12	7	12	–	–	–	–	43	–	Soldier Pond	Daiglo.
																	111		
3	4	5	3	8	–	–	–	–	–	–	–	–	–	–	–	23	–	Eagle Lake	Penney.
–	–	–	–	–	3	7	8	–	–	–	3	–	–	–	–	21	–	Eagle Lake	Chadwick.
																	44		
4	10	11	11	13	11	10	14	13	7	3	2	5	2	–	–	116	–	Ashland	Bridges.
5	3	3	7	6	4	16	8	7	4	5	7	–	–	–	–	75	–	Squa Pan	Reed.
2	3	6	3	11	4	–	–	–	–	–	–	–	–	–	–	29	–	Masardis	Hackett.
830	957	936	902	843	655	817	640	466	485	520	445	439	529	285	73	9822			

TABLE II.

Maine Department of Agriculture Potato Inspection.

SEED SHIPMENTS FROM MARCH 9 TO JULY 4.

Town.	Inspector.	No seed.	Part shipment.	Town total.	Car lots.	Town total.
Patten	Ingram	No seed	–	–	–	–
Sherman	Grant	–	–	–	1	1
Crystal	Tabor	No seed	–	–	–	–
Island Falls	Estabrook	–	2	2	1	1
Dyer Brook	White	–	2	2	37	–
Dyer Brook	Estabrook	–	–	–	2	39
Smyrna Mills	Smith	–	–	–	8	8
New Limerick	Gorham	–	1	1	–	–
Cary's Mills	Crosby	–	4	4	–	–
Houlton	Lovett	–	–	–	13	–
Houlton	Cleveland	–	5	–	2	–
Houlton	Titcomb	–	–	–	31	–
Houlton	Small	–	–	–	20	–
Houlton	McCormick	–	5	10	35	101
Littleton	McNutt	–	–	–	3	3
Monticello	Tingley	–	–	–	38	–
Monticello	Bubar	–	–	–	9	47
Bridgewater	Whited	–	–	–	31	31
Robinson	Robinson	–	–	–	28	28
Mars Hill	Sylvester, V. R.	–	–	–	36	–
Mars Hill	Sylvester, F. A.	–	–	–	18	54
Westfield	Chase, C	–	3	3	41	41
Phair	Sylvester, V. R.	–	2	2	1	1
Easton	Adams	–	3	–	46	–
Easton	Hoyt, E. C	–	–	–	22	–
Easton	Grenier	–	–	3	3	71
Fairmount	Hoyt, H. P	–	2	2	35	35
Maple Grove	Orser	–	2	2	54	54
McShea	Ginn	–	–	–	7	7
Fort Fairfield	McDonald	–	–	–	39	–
Fort Fairfield	Kinney	–	–	–	116	–
Fort Fairfield	Kipp	–	–	–	27	–
Fort Fairfield	Ginn	–	–	–	4	–
Fort Fairfield	Rollins	–	–	–	1	187
Stevens Mills	Rollins	No seed	–	–	–	–
Walton	Maines	–	–	–	10	–
East Linton	Conant	–	–	–	1	1
Presque Isle	Greenwood	–	1	–	10	–
Presque Isle	Perry	–	–	–	19	–
Presque Isle	Brewer	–	–	–	48	–
Presque Isle	Jacobs	–	–	–	14	–
Presque Isle	Hardy	–	–	1	10	101
Guiou's Siding	Guiou	–	–	–	12	12
Washburn, A. V. R	Rolfe	–	–	–	20	20
Bean and Scott's	Kilpatrick	–	–	–	23	23
Maysville	Rhodes	–	–	–	1	1
Mapleton	Hemphill	–	–	–	14	–
Mapleton	Phair	–	–	–	6	–
Mapleton	Barker	–	2	2	–	20
State road	Barker	–	1	1	13	13
Washburn	Stoddard	–	2	2	11	11
Perham	Oliver	–	–	–	7	7
Sweden	Mills	–	–	–	5	–
Sweden	Erickson	–	1	1	2	7
Woodland Center	Parsons	–	1	1	8	8
Caribou Carson, A. V. R.	Sampson	–	–	–	8	–
Caribou	Hardison	–	–	–	72	–
Caribou	Thomas	–	6	–	31	–

TABLE II.—Concluded.

Town.	Inspector.	No seed.	Part shipment.	Town total.	Car lots.	Town total.
Caribou	McIntire	–	6	–	16	–
Caribou	Mills	–	4	16	1	128
Grimes	Hale	–	2	2	28	28
East Road	Stetson	–	–	–	63	63
Goodrich	Chase, W. E.	–	1	1	1	1
Limestone	Chase, W. E.	–	3	–	41	–
Limestone	Chase, H. S.	–	–	3	36	77
Campbells	Irvine	–	1	1	20	20
Ogren	Todd	–	–	–	2	2
Jemtland	Larsson	No seed	–	–	–	–
Stockholm	Anderson	No seed	–	–	–	–
Van Buren	Hammond	–	–	–	19	–
Van Buren	Theriault	–	–	–	34	–
Van Buren	Cleary	–	–	–	18	71
Grand Falls	Pirie	No seed		–	–	–
Grand Isle	Soucy	–	–	–	12	12
Madawaska	Pelletier, J.	–	–	–	16	16
Frenchville	Pelletier, F. W.	–	–	–	4	–
Frenchville	Bouchard	–	–	–	1	5
St. Luce	Bouchard	–	–	–	20	20
Fort Kent	Dufour	–	–	–	8	–
Fort Kent	Michaud	–	–	–	20	–
Fort Kent	Bradbury	–	–	–	5	33
Soldier Pond	Daigle	–	–	–	24	24
Eagle Lake	Penny	–	–	–	3	–
Eagle Lake	Chadwick	–	–	–	3	6
Ashland	Bridges	–	2	2	17	17
Masardis	Hackett	–	–	–	3	3
Squa Pan	Reed	–	–	–	11	11
Total			64	–	–	1470

RECORDS.

The clerk's books showing the complete record of the cars shipped during the inspection period, together with the accounts of the various inspectors are on file in this office.

ACKNOWLEDGMENTS.

The potato dealers and shippers of Aroostook county, the Experiment Station, the College, the Federal Department and the railroads coöperated with this department at all times, and I wish to extend to them all my cordial appreciation. Would say that Mr. Shapovalov of the Experiment Station spent considerable time at Presque Isle in the early part of the inspection disseminating information relative to powdery scab and it helped very materially.

FEDERAL INSPECTION.

It was the consensus of opinion that inspection for the 1914 crop should be under the control of the Federal Horticultural

Board. There were many reasons for this change, the two principal reasons being,—first, it would relieve the dealers and shippers of the state of paying an inspection fee, and second, it was felt that the Federal inspection tag on seed stock would have much greater weight with southern planters than the state tag.

At a hearing in Washington in the latter part of the spring, it was decided that the Federal Board would take over the inspection on August 1. This they did and the work is now under their control.

After the first few months of the shipping season, it was found that the infection of powdery scab was confined almost wholly to Aroostook county and a few towns in bordering counties, so that the quarantine which had hitherto covered the entire state was partially raised.

In order to prevent the introduction of powdery scab from an infected area into other portions of the state it was deemed advisable to adopt necessary regulations.

The Superintendent of Maine Inspection and his agents were appointed as collaborators to carry out these regulations, effective September 21, 1914. These regulations are as follows:

REGULATIONS FOR THE CONTROL AND ERADICATION OF POWDERY SCAB.

Regulation 1. Definitions.

For the purposes of these regulations the following words, phrases, names, and terms shall be construed, respectively, to mean—

(a) Powdery Scab: The disease of potatoes known as Spongospora Subterranea.

(b) Disease similar to powdery scab: Any disease of potatoes, visible upon inspection, which resembles powdery scab in appearance.

(c) Infected potatoes: Potatoes of lots which contain individual tubers infected with powdery scab or any disease similar to powdery scab.

(d) Exposed potatoes: Potatoes grown in fields infected with powdery scab or which have come in contact with soil, tubers, or containers infected with or contaminated by powdery scab.

(e) Seed potatoes: Potatoes neither infected nor exposed which are to be used for seeding purposes.

(f) Table potatoes: Potatoes neither infected nor exposed, and potatoes which have been infected or exposed but from which all tubers visibly infected with powdery scab or any disease similar to powdery scab have been removed, which are to be used for table purposes.

(g) Infected area: Any town, plantation or farm which the State Horticulturist in person or by deputy has found to be infected with powdery scab.

(h) Quarantine Inspector: Any person deputized by the State Horticulturist to make inspections under the state law and these regulations, and to issue to owners and tenants such orders as may be necessary for the enforcement of the regulations with respect to each specific case where powdery scab is found to exist.

The Superintendent of the Maine Potato Inspection Service and the agents and inspectors connected with that service have been deputized as quarantine inspectors to serve in this work.

Regulation 2. Authority for Inspection.

(a) Any owner or tenant in possession of a farm or storage place where potatoes are produced, stored or handled may make application to the nearest inspector-in-charge to have inspection made of his potatoes, storage places, fields, containers, implements or other materials liable to infection with powdery scab.

(b) In the case of any premises wherein powdery scab is suspected to exist, any quarantine inspector has authority to enter and inspect potatoes, storage places, fields, containers, implements and other materials liable to be infected with this disease.

(c) Persons intending to ship potatoes from an infected area to any other point within the State of Maine are required to have all such shipments inspected and certified in accordance with the same rules and regulations as are prescribed by the Secretary of the United States Department of Agriculture for the shipment interstate of potatoes from an area quarantined on account of powdery scab.

Regulation 3. Destruction of Diseased Potatoes.

All tubers found to be infected with powdery scab, after separation, if desired, from the sound tubers with which they are mixed, must be treated in some approved manner for destruction of the disease. Such potatoes may be thoroughly cooked and fed to stock or they may be used for the manufacture of starch, provided the refuse from the factory is disposed of in such a manner as to prevent further spread of the disease in neighboring fields.

Any starch factory wishing to use infected potatoes in the manufacture of its product must first have the method for disposal of its refuse approved by a quarantine inspector.

Regulation 4. Disinfection.

All storage places in which infected potatoes have been kept, and all containers, tools and implements with which they have been handled must be first cleaned thoroughly, then washed, dipped or sprayed with approved disinfectants.

Any of the following solutions are recommended for this purpose: Formaldehyde, one pint 40% solution per 1 gallon of water; mercuric chloride (corrosive sublimate), 1 part to 1000 parts of water by weight; and copper sulphate (bluestone) 1 pound per 15 gallons of water.*

For disinfecting metal tools and implements the formaldehyde solution is the least corrosive.

Regulation 5. Penalty.

Failure on the part of any owner or tenant to comply with orders issued by a quarantine inspector in conformity with these regulations will lay such owner or tenant liable to prosecution and conviction for violation of the state law above cited, penalty for which is a fine of not less than ten dollars, nor more than fifty dollars.

Spraying Demonstrations.

This spring a new policy was adopted by the Bureau of Horticulture in regard to the annual series of spraying demonstrations. Instead of sending notices to the papers and the granges, as has been the custom, no demonstrations were solicited as they have been the previous seasons. Only those parties who had sufficient interest in the demonstration work to correspond with the department, were considered when it came time to make up the schedule of spring meetings.

Twelve meetings were arranged and it was apparent that the State Horticulturist, A. K. Gardner, would not be able to attend any of these meetings, due to the press of work in Aroostook county on the potato situation. This being the case, E. L. Newdick of Sanford was called from his labors in the gypsy

*Where it is also desired to whitewash the interiors of warehouses and cellars the copper sulphate may be used at the same rate in the wash.

Tree Headed Low, with Strong Framework.

moth campaign and with the Assistant Horticulturist, H. P. Sweetser, in charge of the meetings, the schedule was commenced on April 6th, a somewhat later date than in the two previous years.

Because of the additional work at the office desk only three or four days in the middle of each week were devoted to demonstration work. The weather conditions were never so unfavorable for out-of-door meetings as they were this spring. In practically all of the meetings, it was necessary for the individuals to consider health first, and the extreme cold winds and the wet condition of the orchards made it unwise for anyone to stand long out-of-doors, no matter how interested. This condition explains in part at least the noticeable falling off in attendance. The interest seemed to more than make up for the lack in attendance, and, on the whole, the meetings can be considered a success in the seven counties which were visited.

The total number present at the eleven meetings was 305 and 217 trees were sprayed at the various orchards. One meeting was cancelled. One was postponed on account of a heavy snowfall only to be held later in a downpour of rain, with a small group of interested and enthusiastic fruit men.

Certain it is that this method of distributing agricultural knowledge is in no way excelled by any of the various methods of spreading the gospel of better farming.

The towns visited in this work are well scattered and for the most part in sections not previously visited by this bureau in spraying demonstration work.

Date.	Town.	Orchard of		Attendance
April 6	West Buxton	C. W. Haley	–	46
April 7	Alfred	J. E. Roberts	Snow	12
April 8	Eliot	John Raitt	Rain	51
April 10	Standish	Owen Smith	–	18
April 14	Washington	L. M. Staples	Cold	17
April 15	Union	Jesse Calderwood	–	40
April 21	Oakland	R. C. Watson	Cold	30
April 22	St. Albans	–	–	Cancelled.
April 24	North Vassalboro	E. W. Towle	–	32
April 28	Bryant's Pond	R. C. Davis	–	24
May 5	Rockland	J. C. Packard	Rain	23
May 6	Dark Harbor	E. J. Hatch	–	12

Foreign Nursery Stock.

The shipments of foreign nursery stock into this state have been practically the same as last season. The Bureau of Horticulture has attempted to check up the inspection of all of the shipments and in coöperating thus with the Federal Board due watchfulness has been kept to prevent the further introduction of foreign pests.

Inspection during the year has been made on the following list of imported nursery stock. Special attention is called to the number of shipments of azaleas in spite of the devastation of Belgium, the native home of these popular ornamental shrubs.

Name of Plant.	Number of shipments inspected.	Number of plants.	Native country.
Araucarius	1	27	Belgium.
Aristolochia	2	250	France (1). Belgium (1).
Azaleas	14	2,050	Belgium.
Blue Spruce	2	200	Norway (1). Holland (1).
Boxwood	1	100	Holland.
Citrus Trees	1	5	Italy.
Clematis	1	100	Holland.
Forest trees	1	*1,500	France.
Grape vines	1	14	England.
Herbaceous plants	1	250	France.
Hydrangeas	3	285	Holland (2). France (1).
Linden Trees	1	25	Norway.
Palms	2	47	Holland.
Rhododendrons	2	80	Holland.
Rhus thyphina lac	1	100	France.
Roses	7	3,675	England (1). Germany (1). Holland (4). France (1).
Spirea	1	100	Holland.
Trained fruit trees	2	49	France (1). England (1).

*Mt. Desert Nursery, Bar Harbor.

Nursery Stock Investigation.

The Bureau of Horticulture feels that it is imperative that a definite knowledge should be had concerning every shipment of nursery stock into the state. This will serve a triple purpose. First, it will help prevent the shipping of undesirable nursery stock to individuals who have been ignorant of the ways of some nursery agents. Second, it will aid materially in the tracing of shipments known to be infected with disease or infested with serious insect pests, and third, it will assist the bureau in determining the amount of nursery stock shipped into the state each year.

The transportation companies are required by law to notify the Commissioner of Agriculture of the consignment of every shipment as soon as it is received. (P. L. 1913, C. 120, Sec. 5.) This knowledge makes it possible for the Bureau of Horticulture to get in touch with every shipment. Part of this work is done by letter and as much as practicable attended to by a personal investigation.

The spring of 1914 was the first time that this law could be enforced and at best it was impossible to get the detail of the work wholly in hand. A large proportion of the shipments was visited by experts employed in this bureau and in many cases assistance and advice given in regard to care and setting of the stock.

While the returns from this work are far from complete, the statements below give an idea of the extensiveness of the business in this state.

Next spring we expect to have the work so systematized that the returns will be practically complete.

NURSERY COMPANIES WHICH HAVE DELIVERED ORDERS IN THE STATE OF MAINE DURING THE YEAR 1914.

	Name.	Address.	No. of shipments. Spring.	Fall.
1	Adams Company, J. W	Springfield, Mass	3	-
2	Allen Nursery Company	Rochester, N. Y	8	-
3	Allen, W. F	Salisbury, Md	9	-
4	Ames Implement & Seed Co	Boston, Mass	1	-
5	Bacon, W. & A	Boston, Mass	1	-
6	Barclay Nursery	New York, N. Y	1	-
7	Bay State Nursery	No. Abington, Mass	14	3
8	Bauer, J. A	Judsonia, Arkansas	1	1
9	Breck-Robinson Co	Lexington, Mass	7	-
10	Berger Company, H. H	New York, N. Y	1	-
11	Bobbink & Atkins	Rutherford, N. J	6	-
12	Boddington, E. C	New York, N. Y	4	-
13	Bowdoin, E. G	New York, N. Y	1	-
14	Bradley Brothers	Makanda, Ill	1	-
15	Breck, Joseph & Son	Boston, Mass	15	-
16	Brown Brothers Company	Rochester, N. Y	3	-
17	Brown, J. C	Orange, N. J	1	-
18	Brown Nursery Co., F. W	Rose Hill, N. Y	8	-
19	Bryant & Ordway Co	Boston, Mass	1	-
20	Burr, C. R. & Co	Manchester, Conn	24	-
21	Carlton, J. W	Alvin, Texas	1	-
22	Costich, G. A. Co	Rochester, N. Y	3	-
23	Cormens, F. B	East Walpole, Mass	1	-
24	Carpenter, R. E	Worcester, Mass	1	-
25	Carr, C. E	Dighton, Mass	1	-
26	Cedar Park Farm	Dighton, Mass	1	-
27	Continental Nurseries	Franklin, Mass	1	-
28	Chapman, W. E	Framingham, Mass	1	-
29	Chase Brothers	Rochester, N. Y	65	1
30	Chase, C. H	Rochester, N. Y	4	-
31	Chase Co., G. H	Geneva, N. Y	8	-
32	Chase, Homer N	Geneva, N. Y	28	1
33	Charleton Nursery Co	Rochester, N. Y	3	-
34	Charlton & Sons, John	Rochester, N. Y	1	-
35	Childs, John Lewis	Floral Park, N. Y	4	-
36	Clark, A. J	Framingham, Mass	1	1
37	Clark, Daniel A	Fiskeville, R. I	2	-
38	Cobb & Co., W. F	Geneva, N. Y	64	-
39	Coburn, J. E	Everett, Mass	1	-
40	Cochran, F	Boston, Mass	1	-
41	Collingwood, H. W	Woodcliff Lake, N. J.	1	-
42	Conrad & Jones Co	West Grove, Pa	2	-
43	Concord Nursery	Concord, Mass	1	-
44	Continental Plant Co	Kittrell, N. C	1	-

	Name.	Address.	No. of shipments. Spring.	Fall.
45	Cottage Garden Co	Queens, N. Y	1	-
46	Covel Fern Co	New Salem, Mass	2	-
47	Cushing, J. H	Quidnick, R. I	1	-
48	Denton, Williams & Denton	Dansville, N. Y	2	-
49	Dingee & Conard Co	West Grove, Pa	5	-
50	Downing & Co., T. D	Boston, Mass	1	-
51	Dreer, H. A	Philadelphia, Pa	25	-
52	Eager Co	Waverley, Mass	1	-
53	Eastern Nurseries Co	Holliston, Mass	6	-
54	Educational Publishing Co	Roxbury, Mass	1	-
55	Elizabeth Nursery Co	Elizabeth, N. J	3	-
56	Eliot Nurseries	Pittsburg, Pa	14	5
57	Ellwanger & Barry	Rochester, N. Y	18	1
58	Elm City Nursery Co	New Haven, Conn	4	-
59	Ernst Nurseries	Eaton, Ohio	1	-
60	Farquhar, R. & J	Boston, Mass	80	2
61	Fairview Nurseries	Rochester, N. Y	2	-
62	Farmer, L. J	Pulaski, N. Y	6	1
63	Farr, Bertrand H	Wyomissing, Pa	1	1
64	Fernald, W. G	Eliot, Me	3	-
65	Fern & Flower Co	Southwich, Mass	2	1
66	Finn, John W	Dansville, N. Y	3	-
67	First National Nurseries	Rochester, N. Y	5	-
68	Fish, C. R. & Co	Worcester, Mass	10	-
69	Foot, Mrs	Marblehead, Mass	1	-
70	Fottler, Fiske & Rawson Co	Boston, Mass	24	2
71	Foy, Patrick	Roanoke, Va	1	-
72	Framingham Nurseries	So. Framingham, Mass	5	-
73	Frost, C. R	Worcester, Mass	2	-
74	Galvin, Thos. F	Boston, Mass	1	-
75	Gardner Nursery Co	Osage, Iowa	16	1
76	German Nurseries & Seed House	Beatrice, Nebraska	2	-
78	Good & Reese Co	Springfield, O	3	-
79	Glenn Brothers	Rochester, N. Y	20	-
80	Graham Nursery Co	Geneva, N. Y	1	-
81	Green's Nursery Co	Rochester, N. Y	224	3
82	Gregory, J. J. H	Marblehead, Mass	2	-
83	Gray, Thos. J. Co	Boston, Mass	2	-
84	Grover & Co., F. E	Rochester, N. Y	1	-
85	Gurney & Co., H. H	Geneva, N. Y	24	-
86	Hall, L. W., & Co	Rochester, N. Y	4	-
87	Harmon Co., M. H	Geneva, N. Y	12	-
88	Harrison, J. G. & Son	Berlin, Md	8	-
89	Harris, J	Cold Water, N. Y	2	-
90	Hawkes Brothers	West Chester, Pa	1	-
91	Haxton, F	Chicago, Ill	1	-
92	Haynes, S. A	Worcester, Mass	1	-
93	Heath & Co	Manchester, Conn	1	-
94	Henderson, Peter & Co	Jersey City, N. J	22	1
95	Herr & Co., A. M	Lancaster, Pa	2	-
96	Herrick Seed Co	Rochester, N. Y	12	-
97	Hill Nursery Co., D	Dundee, Ill	1	1
98	Hill Co., E. G	Richmond, Ind	3	-
99	Hooker, Wyman Co	Rochester, N. Y	11	-
100	Horne, A. P. Co	Manchester, N. H	5	-
101	Hosford, F. H	Charlotte, Vt	16	1
102	Houghton & Dutton	Boston, Mass	4	-
104	Hubbard & Co., Paul M	Bristol, Conn	1	-
105	Hoyt's Sons Co., Stephen	Canaan, Conn	1	-
106	Hunt & Co., W. W	Hartford, Conn	2	-
107	Huntington, R. E	Painesville, O	1	-
108	Hurd, Allen Co	Boston, Mass	1	-
109	Ilgenfritz Sons Co., I. E	Monroe, Mich	2	-
110	Irwin, Roman J	Hornell, N. Y	1	-
111	Jackson & Perkins Co	Newark, N. J	1	-
112	Kelsey, Harlan P	Salem, Mass	3	-
113	Kelsey Nursery Co	St. Joseph, Mo	2	-
114	Kelley Brothers	Dansville, N. Y	13	1
115	Kellogg Co., R. M	Three Rivers, Can	7	-
116	King, B	Tewksbury, Mass	2	-
117	Knight & Son, David	Sawyer, Mich	1	-
118	Knight & Bostwick	Newark, N. J	4	-

	Name.	Address.	No. of shipments.	
			Spring.	Fall.
119	Knight & Struck Co	New York, N. Y	5	-
120	Leighton Nurseries	Cumberland Ctr., Me.	1	-
121	Leighton, S. M	Dexter, Me	1	-
122	Leuthy & Co., A	Roslindale, Mass	2	-
123	Little Tree Farms	Framingham, Mass	6	-
124	Livingston Co	Philadelphia, Pa	1	-
125	Loeses & Co., Frederick	Brooklyn, N. Y	1	-
126	Lovett, J. F	Little Silver, N. J	8	1
127	MacNiff Horticultural Co	New York, N. Y	3	-
128	Maloney Bros. & Wells Co	Dansville, N. Y	27	-
129	Manning Nurseries	No. Wilmington, Mass.	2	-
130	Maule, Wm. Henry	West Grove, Pa	1	-
131	May, L. L	St. Paul, Minn	1	-
132	McCabe, E. L., Co	Rochester, N. Y	1	-
133	McCabe, J. C	Bangor, Me	1	-
134	McCabe & Company	Bangor, Me	3	-
135	McCabe, R. F	Bangor, Me	1	-
136	McGlennon & Kirby	Rochester, N. Y	2	-
137	McCarthy & Co., N. F	Boston, Mass	3	-
138	McGregor Bros. Co	Springfield, O	1	-
139	Meehan & Sons, Thomas	Germantown, Pa	5	-
140	Merrick, J. L. & Co	Waterville, Me	2	-
141	Mills Seed House	Rose Hill, N. Y	1	-
142	Mitchell, E. A	Newark, N. J	1	-
143	Mitting, Alfred	Holland, Mich	3	-
144	Mohican Peony Gardens	Sinking Springs, Pa	2	-
145	Monte, Wm. Henry	Philadelphia, Pa	1	
146	Moore & Co., W. C	Newark, N. J	9	-
147	Morey, J. B	Dansville, N. Y	2	-
148	Morris Nursery Co	West Chester, Pa	2	-
149	Morse, Fred H	Freeport, Me	1	-
150	New England Nurseries	Bedford, Mass	50	3
150	N. H. State Nurseries	Durham, N. H	1	-
152	O'Legg, W. E	Boston, Mass	1	-
152	Old Colony Nurseries	Plymouth, Mass	6	-
154	Orange County Nurseries	Cornwall, N. Y	1	-
155	Palisade Nurseries	Sparkill, N. Y	1	-
156	Park, Geo. W	Gordonville, Pa	1	-
157	Pennock, Meehan Co., S. S	Washington, D. C	2	-
158	Peterson, Geo. H	Fair Lawn, N. J	7	1
159	Perry, Basil	Georgetown, Del	2	-
160	Perry Nursery Co	Rochester, N. Y	5	-
161	Pierson, F. R	Tarrytown, N. Y	2	-
162	Pierson, A. N	Cromwell, Conn	6	1
163	Pomeroy, Daniel N	Lockport, N. Y	2	-
164	Pratt, Chas. S	Reading, Mass	19	3
165	Prestage, J. G	Allegan, Mich	1	-
166	Randall, Alton E	Dansville, N. Y	1	-
167	Rawhings, Elmer	Olean, N. Y	1	-
168	Reilly Bros	Dansville, N. Y	9	-
169	Reilly, Wm. J	Dansville, N. Y	1	-
170	Richland Nurseries	Rochester, N. Y	7	-
171	Rice Brothers	Geneva, N. Y	7	-
172	Rice, T. W	Geneva, N. Y	13	-
173	Ritchy, F. W	Lancaster, Pa	2	-
174	Robbin Hill Nursery	Chelmsford, Mass	1	-
175	Rupert & Son, W. P	Seneca, N. Y	14	-
176	Santa Barbara Nurseries	Santa Barbara, Cal	1	-
177	Skedelsky, S. S	Philadelphia, Pa	1	-
178	Sheerin's Nurseries	Dansville, N. Y	8	-
179	Shenandoah Nurseries	Shenandoah, Iowa	1	-
180	Southworth Brothers	Beverly, Mass	2	-
181	Smith, H. J	Hinsdale, Mass	2	-
182	Smith, W. & T	Geneva, N. Y	8	1
183	Spring Hill Nurseries	Tippecanoe City, Ohio	3	-
184	Squires, H. L	Good Ground, N. Y.	3	-
185	Stark Brothers Nursery Co	Louisiana, Mo	18	-
186	Stark Nurseries, Wm. P	Stark City, Mo	8	-
187	Stuart & Co., C. W	Newark, N. Y	29	-
188	Storrs & Harrison Co	Painesville, O	3	-
189	Stumpp & Walter Co	New York, N. Y	5	-

	Name.	Address.	No. of shipment.	
			Spring.	Fall.
190	Sunnyside Fruit Farm	Reading, Mass.	-	1
191	Tibbetts, C. H	East Walpole, Mass.	1	-
192	Thurlow Sons, T. C	West Newbury, Mass.	3	-
192	Van Dusen Nurseries	Geneva, N. Y	11	1
194	Vaughn Seed Store	New York, N. Y	2	-
195	Vicks Sons, James	Rochester, N. Y	2	-
196	Vincent, Jr., & Sons Co., R	White Marsh, Md	2	-
197	Walsh, M. H	Woods Hole, Mass	4	-
198	Wanamaker, John	Philadelphia, Pa	1	-
199	Wells Nurseries, F. W	Dansville, N. Y	24	1
200	West Side Nursery Co	Worcester, Mass	28	3
201	Weston, Henry	Hempstead, N. Y	1	-
202	Weston & Co., A. R	Bridgman, Mich	1	-
203	White Bros	Medena, N. Y	1	-
204	Whiting Nurseries	Geneva, N. Y	5	-
205	Whitman Bros	Lowell, Mass	1	-
206	Whitten's Nur., C. E.,	Bridgman, Mich	2	-
207	Whittier & Co., W. B	So. Framingham, Mass	1	-
208	Wiley & Sons, H. S	Cayuga, N. Y	9	-
209	Williams, L. E	Exeter, N. H	2	2
210	Wood, Allan L	Rochester, N. Y	26	-
211	Woodlawn Nurseries	Rochester, N. Y	3	-
	Miscellaneous		65	3
	Total		1,529	51

Nursery Agents.

During the season of 1914 more agents' licenses have been issued from this office than in any other year since the adoption of the law creating a license fee. In all one hundred and twenty-two licenses were issued. These licenses were applied for by agents, solicitors and dealers. It might be well to note that stores, especially department stores, handling roses and similar ornamental shrubs have been required to have a license for the first time. It became evident early in the season that certain parties were violating the law, and in August Mr. C. A. Jones of China was appointed to investigate such cases. Sixty such cases were looked after and four carried to court. There was no question as to the validity of our present law and each man was fined ten dollars and costs. A few cases were settled out of court and the violators were allowed to take out a license to cover their period of activity. This was done because of the fact that these parties were without doubt ignorant of the passage of the act. Mr. Jones covered the greater part of the state, but no doubt there were some agents selling stock without a license who were not rounded up. The adoption of the law making it compulsory for transportation companies to notify the State Department of receipt of consignments of nursery stock and the name of the consignee helped materially in getting a line on the various agents. Upon receipt of such information it was possible in most cases to find out from the person receiving the stock who the selling agent had been. Thus far, the stock coming from the various nurseries has been of sufficiently high grade to warrant the issuance of a license to agents representing them.

Following is the list of agents licensed in 1914:

NURSERY AGENTS LICENSED IN 1914.

Name.	Address.	License expires 1915.
Abbott, Reuben	Thorndike	May 25.
Alley, Elmer W	215 College Ave., Waterville	Jan. 1.
Atwood, W. H.	Lisbon	July 31.
Bagley, James E	Monroe	Aug. 13.
Barlow, L. A	East Boothbay	Aug. 13.
Bessey, Walter P	Freedom, R. F. D. 17	April 7.
Bisbee, Clinton W	West Sumner	July 20.
Bolton, F. T.	341 Preble St., So. Portland	July 15.
Bradeen, Arthur C	Norway, Maine	June 13.
Campbell, John C	Steuben	Oct. 31.
Cannon, S. T.	183 State St., Augusta	Aug. 12.
Carpenter, Frank	Highland Ave., Houlton	Feb. 9.
Cate, Ernest W	Dresden Mills	June 4.
Cochran, Isaac	Caribou	July 20.
Cole, Harold J.	Lee, R. F. D	July 14.
Cole, J. D	Lee	May 26.
Cullen, John W	Robinson	Oct. 6.
Cummings, A. S	West Paris	July 7.
Daggett, G. L	Sherman Mills	June 12.
Daggett, Lee	Strong	July 30.
Daicy, K. W	West Scarboro	June 22.
Dakin, E. J	Wilton	Jan. 16.
Davis, Albert C	South Paris	Aug. 26.
Decrow, J. S.	Brooks	Jan. 1.
Dolan, W. H	33 Elm St., Waterville	May 11.
Dudley, F. H.	71 Davis Ave., Auburn	July 22.
Dyer, Alden	Franklin, R. F. D	Aug. 21.
Earle, C. H.	Lewiston	Oct. 1.
Eaton, Samuel H.	Oxford	July 13.
Ellingwood, A. P.	Monroe	Jan. 28.
Elliott, Harry A	Strong, R. F. D. 2	Jan. 15.
Ellis, Mrs. Nellie	Winslow	Aug. 13.
Ellis, R. T	Gardiner, R. F. D. 9	Aug. 28.
Filer, B	Monroe	Sept. 29.
Foss, Sr., S. O	142 Pleasant St., Auburn	May 21.
Fowler, W. B.	Monmouth, Box 5	Aug. 1.
Fox, Percy	Brook St., Sanford	July 3.
Fuller-Cobb Co	332 Main St., Rockland	Jan. 1.
Furbush, E. W.	Greene	June 9.
Gay, LaForest M	Sebago Lake	Dec. 8.
Gilman, H. W	Main St., So. Berwick	July 22.
Gove, G. W	Dexter, Box 1012	Aug. 28.
Gott, J. M	Wayne	June 4.
Grant Co., W. T	95-101 Lisbon St., Lewiston	May 12.
Gray, Wm. D.	Box 241, Richmond	Jan. 15.
Hale, Herbert H	South Bluehill	Sept. 8.
Hart, Rodney E	Ellsworth, R. F. D 1	Sept. 25.
Hodgdon, D. W.	Boothbay Harbor	Aug. 28.
Holmes, Amos E	Oakland, R. F. D. 33	July 27.
Hooper, E. H.	89 Lamb St., Cumberland Mills	Feb. 18.
Huntress, Sarah L	South Berwick, Box 263	Sept. 5.
Johnson, Harry N	Brooks	Mar. 2.
Kendall & Whitney	Portland	Jan. 21.
Kimball, Geo. E	Pittsfield	Jan. 16.
Kresge Co., S. S	Detroit, Mich.	May 11.

Name.	Address.	License expires 1915.
Leighton, B. F	West Gouldsboro	July 3.
Leighton, I. M	824 Stevens Ave., Woodfords	Jan. 24.
Littlefield, S. L	Minot	Jan. 21.
Lowell, C. M	Farmington, R. F. D. 1	Jan. 13.
McCabe, George L	Bangor	July 14.
McKechnie, George B	Danforth	May 13.
Marrow, John H	East Winthrop	Feb. 20.
Marston, David	Monmouth	June 16.
Merrick, W. S	Unity	Jan. 1.
Merrill, James	7 School St., Augusta	July 13.
Nash, A. D	Damariscotta, R. F. D. 32	June 3.
Nichols, D. G. Co., E. C	37 Main St., Bangor	May 5.
Norris, E. B	117 Spring St., Gardiner	June 19.
Norton, A. H	Farmington	Sept. 21.
Norton, Clyde C	Farmington	Sept. 12.
Pederson & Son, S	Scarboro, Box 68	May 23.
Pennell, Luther M	Freeport	Sept. 18.
Perkins, Fred B	Sherman Mills	Aug. 14.
Phillips, Milton	Madison	July 21.
Pinkham, C. W	Troy, R. F. D. 1	June 23.
Pinkham, Mrs. H. F	Boothbay Harbor, Box 444	Sept. 26.
Pinkham, R. B	Troy, R. F. D. 1	Aug. 13.
Porteous, Mitchell & Braun Company	Portland	April 21.
Powers, E. L	499 Hammond St., Bangor	July 14.
Prescott, Emery	Etna	July 14.
Purinton, W. S	25 Melville St., Augusta	June 3.
Reynolds, Bartlette C	17 Arlington St., Woodfords	Jan. 22.
Ricker, A. H	No. Lebanon	Aug. 28.
Roberts, James A	East Waterboro	Aug. 14.
Robertson, L. C	Weld	Mar. 4.
Rogers, L. S	Brownville	Jan. 16.
Royal, Harold L	Milo, R. F. D. 1	Mar. 16,
Ruhl, Edward	Farmington, R. F. D. 1	Mar. 31.
Savage, J. Frank	Wiscasset, R. F. D. 2, Box 57	Oct. 14.
Sawyer, C. L	63 Church St., Westbrook	Nov. 4.
Schwartz, E. A	Kennebunk	Dec. 19.
Seavey, Jedediah	Bucksport	Feb. 12.
Senior, John C	7 Lincoln St., Sanford	Mar. 11.
Sherman, Harry L	Gorham, R. F. D. 2	Dec. 17.
Shorey, A. A	Mechanic Falls	June 5.
Shorey, Geo. B	36 Cumberland St., Brunswick	Jan. 6.
Small, R. H	Harrington	Jan. 14.
Small, W. Scott	Limington	June 10.
Smith, Alfred J	20 Plaisted St., Gardiner	June 23.
Smith, Isaac S	Anson	Aug. 18.
Smith, W. H	Waterville, R. 38	Jan. 19.
Staples, Nicholas	West Kennebunk	Aug. 29.
Stewart, C. H	Unity	Nov. 30.
Stultz, Harry B	184 Highland Ave., Gardiner	Dec. 18.
Tash, Geo. W	New Vineyard	July 20.
Taylor, Amos F	Ayers	June 17.
Tebbetts, Oscar	Readfield	June 9.
Tibbetts, J. B	Newport	Jan. 29.
Turner, Harry M	Springvale	May 1.
Urann, H. H	East Sullivan	July 23.
Victory, A. W	Franklin Ave., Houlton	Aug. 17.
Wasson, L. S	Bucksport, R. F. D. 2	Aug. 17.
Webber, Harrison W	Mount Vernon	April 24.
White, A. K	Richmond, R. F. D. 1	May 26.
Whittemore, F. H	North Leeds	May 29.
Wiggin, C. S	Waterford	Dec. 22.
Williams, Fairfield	Solon	Aug. 13.
Wood, E. L	Unity	Nov. 6.
Woodman, Fred D	Winterport, R. F. D. 1	April 24.
Woodward, George H	115 Highland Ave., Gardiner	Dec. 29.
Woolworth Co., F. W	Portland	May 11.
Young, Melvin S	Red Beach	Sept. 12.

Nursery Inspection.

Complying with the law concerning the inspection of nurseries, or other places where plants are grown and offered for sale, the various nurseries in the state were visited as usual and the condition noted.

Practically all of the nurseries listed in last year's report were visited and some additional ones were added to the number during the past season. San Jose scale, woolly aphis, rose scale and gypsy moths were the principal cause for withholding the certificates. In all of the cases referred to, the owners were able to control the various pests by careful spraying and removal of badly infested specimens.

Several nurseries were inspected without a request being made by the owner and in a few instances the stock was in such a neglected condition that no certificate was issued, pending a definite request from the owner.

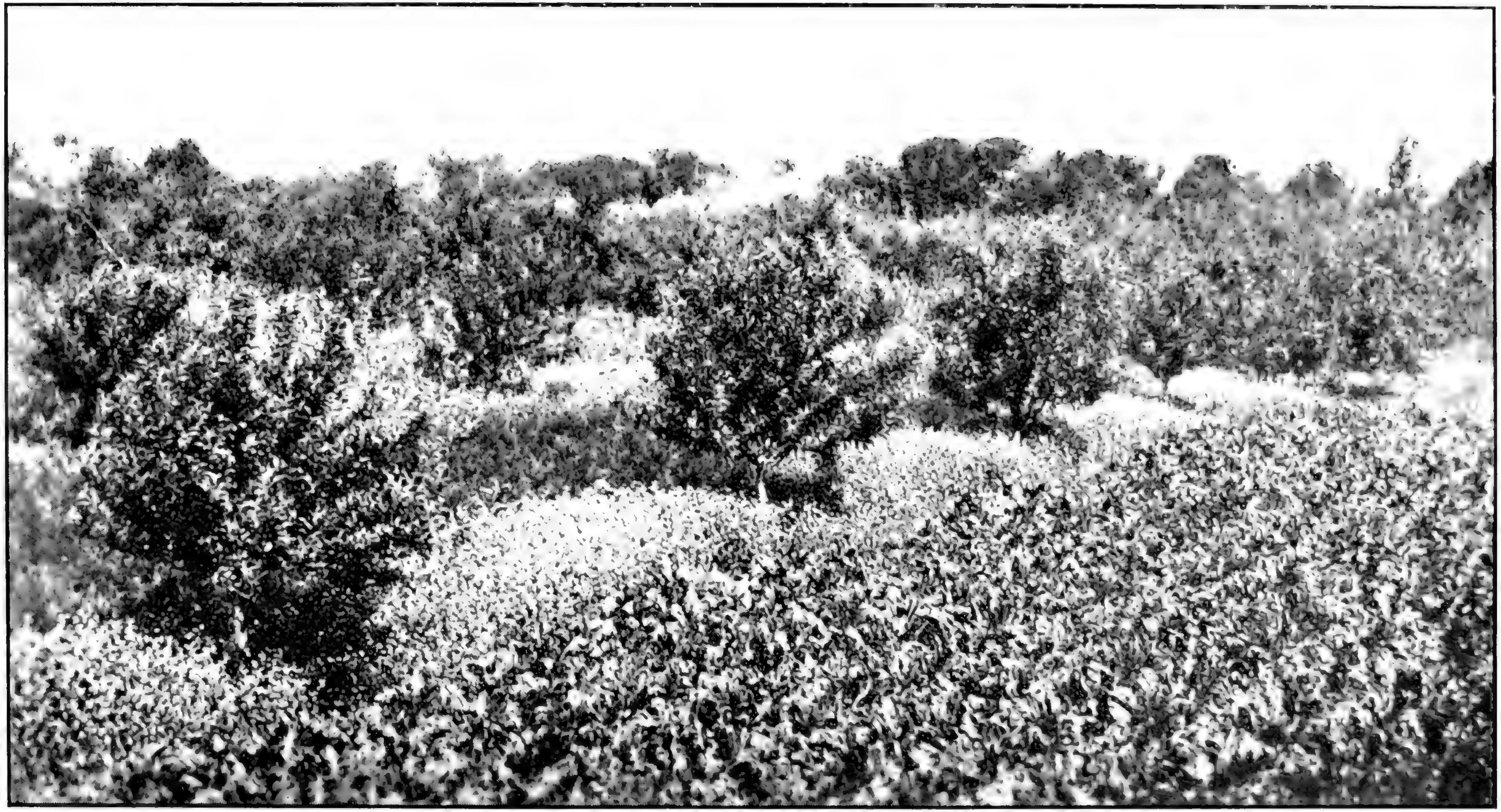
The records show that various plant pests were discovered and that definite steps for control were taken immediately. The pests which were reported are listed below and all nurserymen are cautioned to watch for their presence that control may be made at once.

Crown gall on brambles.
Orange rust on blackberries.
Oyster-shell scale.
Chermes gall on spruce.
Pine tip borer.
Aphis of various sorts.
Currant worms.
Rose stock borer.
Pear slug.
Rose slug.
Cottony scale on elm.
Gooseberry worm.
Spruce bud worm.
European fruit scale.
Barbary leaf rust.
Borers.
Hairy gall.
Raspberry cane borers.

A list of the certified nurseries is included in this report, as may be noted.

NURSERY INSPECTION

NAME OF NURSERY.	Date of inspection.	Acres.	Apple.	Pear, peach.	Cherry, plum.	Raspberry.	Currant.	Gooseberry.	Blackberry.	Miscellaneous.	Conifer.	Hard woods.	Ornamental shrubs.	Total.	Trees condemned.
A. A. Conant, Hebron	July 14	¼	–	–	–	500	–	–	–	–	–	–	–	500	–
A. R. Bodge, Dexter	July 30	1½	–	–	–	–	1,000	500	–	–	–	–	–	1,500	–
Casco Bay Nursery Co., Yarmouth	Oct. 30	–	–	–	–	–	–	–	–	–	2,500	–	–	2,500	–
L. R. Chapman, New Sharon	Aug. 10	2½	–	–	–	5,000	–	–	–	–	–	–	–	5,000	–
J. P. Chaput, Auburn	June 22	2	–	–	–	3,500	–	–	500	–	–	–	–	4,000	–
Homer N. Chase, Buckfield	July 15	1	5,000	–	–	–	–	–	–	–	–	–	–	5,000	–
W. H. Conant, Buckfield	July 15	1½	–	–	–	1,000	–	–	–	–	–	–	–	1,000	–
R. J. Craig, Woodfords	July 11	1	–	–	–	3,000	250	25	–	–	–	–	–	3,275	–
F. H. Dudley, Auburn	June 23	¼	–	–	–	200	–	–	–	25	50	30	12	317	–
A. A. Eastman, Dexter	July 30	2	–	–	–	1,000	2,000	2,000	–	–	–	–	–	5,000	–
R. H. Eveleth, New Gloucester	Sept. 18	1	–	–	–	3,000	–	–	–	–	–	–	–	3,000	–
L. W. Fernald, Eliot	July 11	1½	–	–	–	–	75	–	500	200	–	–	300	1,075	–
W. D. Foss, Mechanic Falls	Nov. 9	1	–	–	–	–	–	–	–	500	–	–	–	500	–
L. C. Goddard, Woodfords	June 29	½	1	2	2	–	–	–	–	15	10	–	285	315	–
Wm. Hoyt, Dexter	June 30	½	Ginson												
J. C. Hussey, Oakland	June 19	2	–	–	–	750	–	–	–	50	30	5	850	1,685	–
A. E. Inman, Silvers Mills	July 30	1	–	–	–	1,000	250	250	–	–	–	–	–	1,500	–
H. A. Jackson, Portland	July 15	5	50	–	–	–	–	–	–	–	500,000	500	500	501,050	–
A. F. Jordan, Portland	May 11	½	750	27	7	1,000	150	10	150	156	100	275	4,200	6,825	–
E. A. Lapham, Pittston	June 16	¼	–	–	–	500	–	–	–	–	–	–	–	500	–
T. M. Lombard, Auburn	June 23	½	–	–	–	1,000	–	–	–	–	–	–	–	1,000	–
W. C. Lufkin, Rockland	July 8	3	–	–	–	7,000	300	250	200	–	–	–	–	7,750	–
John McCabe, Bangor	Aug. 8	½	–	20	–	–	–	–	–	–	–	500	200	720	–
E. R. Macomber, Woodfords	June 29	½	70	6	20	100	12	–	–	–	5	15	500	728	–
G. L. Mahoney, Saco	Aug. 28	2	–	–	–	–	–	–	–	50	100,000	500	500	101,050	–
H. F. Maxim, Locke's Mills	July 22	12½	–	–	–	35,000	–	–	–	–	–	–	–	35,000	–
Mrs. H. L. Merrill, Auburn	Oct. 2	¼	–	–	–	1,000	–	–	–	–	–	–	–	1,000	–
Wm. Miller, Bar Harbor	July 1	¼	–	–	–	–	–	–	–	250	–	125	600	975	–
Mitchell & Co., Waterville	Sept. 1	5	100000	–	1,000	–	–	–	–	–	–	3,000	4,000	108,000	–
Mt. Desert Nurseries, Bar Harbor	June 30 / July 1	20	1,700	150	40	200	1,000	–	–	20,050	16,000	6,500	30,000	75,640	–
Mt. Desert Nurseries, N. East Harbor	June 30	1	–	–	–	–	–	30	25	–	600	800	250	1,705	–
C. S. Perkins, Vassalboro	June 17	½	–	–	–	350	–	–	200	–	–	–	–	550	–
C. A. Perley, Winthrop	July 3	⅓	7,000	–	–	–	–	–	–	–	35	100	50	7,185	–
J. E. Plummer, So. Windham	July 17	3	–	–	–	7,000	–	–	5,000	–	–	–	–	12,000	–
D. A. Pollard, Auburn	Oct. 2	½	–	–	–	1,000	–	–	–	–	–	–	–	1,000	–
G. M. Roak & Co., Auburn	June 22	¼	–	–	–	–	–	–	–	50	–	–	250	300	–
T. W. A. Smith, Biddeford	July 10	⅛	–	–	–	–	–	–	–	25	–	–	25	50	–
Strout's Nursery Co., Biddeford	July 10	¼	–	–	–	–	–	–	–	35	4	1	250	290	–
G. M. Twitchell, Monmouth	June 17	¼	–	–	–	250	50	50	–	–	–	–	–	350	–
E. W. Worcester, Ellsworth	Nov. 23	6	–	–	–	17,000	300	500	50	–	–	–	–	17,850	–



Intercropping System.

Gregory Orchard.

The first contest for the Gregory Orchard Prize has been completed and the awards made. In general the results were as satisfactory as could be expected under the circumstances. Sufficient has been said in our previous reports to cover the work done. It might be well, however, to incorporate in this report, the report of the judges as made to the Governor and Council. That report is as follows:

BUREAU OF HORTICULTURE.

October 28, 1914.

To His Excellency, Hon. William T. Haines, Governor of Maine, and the Honorable Executive Council:

Gentlemen:—In accordance with the provisions embodied in Chapter 60 of the Resolves of nineteen hundred and eleven, relating to the award of the Carleton Prize, the Committee of Judges begs to offer its report.

A. K. Gardner, Augusta,
Wilson H. Conant, Buckfield,
H. P. Sweetser, Augusta,
Committee.

On November one, nineteen hundred and nine, the late Mr. James J. H. Gregory of Marblehead, Mass., offered a first mortgage, one thousand dollar bond, to the State of Maine.

The accumulated interest on this bond, to the sum of two hundred dollars ($200.00) was to be given as a premium to the farmer having the most thrifty and well kept orchard of one acre or more of apple trees, five years from planting, on his own land. This orchard was to be set in nineteen hundred and ten and judged in nineteen hundred and fourteen. Provision was made for the appointment of the judges in July, nineteen hundred and fourteen, who should report their decision to the Governor and Council in October.

Upon the solicitation of the Department of Agriculture additional premiums were donated as follows:

Premium by a friend	$150.00
Bowker Company, Boston	100.00
B. G. Pratt Company, New York City	100.00
Douglass Pump Company, Middletown, Conn.	100.00

Deming Pump Company, Salem, Ohio............	50.00
Charles J. Jager Company, Boston, Mass..........	50.00
Portland Farmers' Club, Portland, Maine.........	50.00

ELIMINATION OF SOME OF THE ORCHARDS.

One hundred and seventy-eight farmers entered orchards in the contest. During the past four years, members of the Bureau of Horticulture have made frequent visits to the orchards. Many contestants encountered serious difficulties and some withdrew each year.

During the summer of 1913, nearly all of the orchards were visited by two of the judges who are also members of the Bureau of Horticulture, and at that time comparative values were obtained through the use of a score card especially prepared for this work. Owing to the lack of sufficient funds, it seemed expedient to eliminate all unnecessary expense. To accomplish this end it was deemed advisable to visit only the orchards which with the best of care and favorable conditions might have a possible chance for one of the premiums, and also those not visited in 1913. A circular letter was sent to all the contestants who would be excluded, giving the complete score of their orchard, their relative standing, and asking their consent to the plan. With the coöperation of the growers to this plan it was found necessary to visit only sixty-five orchards.

TRANSPORTATION.

With the approval of the State Auditor, Mr. Callahan, arrangements were made for a driver and the Ford car of Mr. A. A. Conant, Hebron, Maine.

SCORE CARD.

A. In judging the orchards a score card was essential and after considering the values of different factors governing the relative rating, the committee adopted such a card.

B. Copy of card.

MAINE DEPARTMENT OF AGRICULTURE,
AUGUSTA, MAINE.

Score Card for the Carleton Orchards.

Name .... Address ....

	Perfect	Allowed
General Appearance.		
1. Foliage		
Color	50	
Size	25	
2. Size for Variety.............		
Uniformity	50	
Caliper	75	
Diameter of Head.........	75	
Height of Head...........	75	
3. Spacing	75	
4. Alignment	25	
5. Fruitation	25	
Condition.		
1. Freedom Mechanical Injury...	75	
2. Freedom Insect Injury........	75	
3. Freedom Disease Injury......	75	
4. Maturity of Wood...........	75	
Pruning.		
1. Correct Cutting	150	
2. Protection of Wounds........	50	
Cost	25	
Total	1,000	

Remarks: ....

....

....

ORCHARDS INSPECTED.

The orchards were visited and scored in the following order:

Name.	Address.
Isaac Chase	Buckfield
Fred Ricker	Turner
Arch D. Leavitt	Turner
Stephen Rose	Greene
C. K. Meade	Greene
E. S. Dixon	Sabattus, R. F. D.
A. C. Frost	Wales
Dr. G. M. Twitchell	Monmouth
F. M. Soper	Winthrop
M. S. Fifield	Manchester
F. E. Lane	Litchfield
R. A. Douglass	Bowdoinham
E. S. Edgecomb	Bowdoinham
R. J. Patten	Topsham
Charles E. Nason	Wiscasset
Orrin McFadden	Cedar Grove
W. C. Ford	Whitefield
W. B. Ralph	Waldoboro
Osmond Emery	Marlboro
J. W. Law	Union
Raymond Thurston	Union
J. F. Calderwood	Union
M. B. Hobbs	Hope
C. A. Dunton	Hope
L. A. Weaver	Hope
W. A. Morrill	Belmont
Delbert Paul	Morrill
F. C. Currier	Morrill
M. B. Smith	Belfast
C. B. Dow	Monroe
A. L. Blaisdell	Winterport
Mrs. C. L. Morang	Ellsworth
C. L. Morang	Ellsworth
E. E. Page	East Corinth
Mrs. F. T. Wentworth	Exeter
William Bragger	Exeter

Mrs. William Bragger.............................Exeter
C. L. Jones.............................Corinna
C. H. Hescock.............................Foxcroft
A. W. Gilman.............................Foxcroft
C. S. Bean.............................Wellington
H. D. Eaton.............................Waterville
F. L. Towne.............................Madison
Joseph Matson.............................Solon
A. C. Greenleaf.............................Farmington
J. A. Blake.............................Farmington
John P. Swain.............................Farmington
A. L. Hardy.............................Wilton
J. B. Bryant.............................Buckfield
E. E. Conant.............................Buckfield
Edgemont Farm.............................Hebron
Harry Bearce.............................Hebron
E. L. Burns.............................Oxford
S. E. Cobb.............................Oxford
R. L. Cummings.............................West Paris, R. F. D.
Wilson Morse.............................Waterford
H. M. Verrill.............................Standish
E. W. Dolloff.............................Standish
L. J. Dole.............................Limington
W. W. Goodrich.............................Berwick
H. P. Abbott.............................Eliot
H. G. Emery.............................Eliot
W. P. Johnson.............................North Yarmouth
George W. Waterman.............................New Gloucester
Chester E. Chipman.............................Poland

At the close of the contest it was found upon examination of the scores that the prizes had been won as follows:

Given By	Winner.	Address.	Prize.	Score.
Gregory Prize	Miller B. Hobbs	Hope	$200	974 3-4
Premium by a friend	E. W. Dolloff	Standish	150	969 1-8
B. G. Pratt Company	Wilson M. Morse	Waterford	100	961 3-8
Douglas Pump Company	Mrs. Wm. B. Bragger	Exeter	100	955
Deming Pump Company	Charles Hescock	Foxcroft	50	954 1-30
Charles J. Jager Company	Harry W. Bearce	Hebron	50	952 1-12
Portland Farmers' Club	Willard A. Morrill	Belmont	50	949 5-6

Other orchards scoring over 900 were as follows:

Name:	Address:	Score:
William Bragger,	Exeter	949
E. S. Dixon,	Wales	941 1-5
Chester E. Chipman,	Poland	940 1-12
C. L. Jones,	Corinna	938 29-84
A. C. Greenleaf,	Farmington	935 3-8
J. W. Law,	Union	933 7-8
Raymond Thurston,	Union	930
F. L. Towne,	Madison	920
Mrs. F. T. Wentworth,	Exeter	914 3-8
S. E. Cobb,	Oxford	913 8-54
M. S. Fifield,	Manchester	904 2-3
C. S. Bean,	Wellington	902 3-8
R. L. Cummings,	West Paris, R. 2	902
C. L. Morang,	Ellsworth	900 7-8
E. E. Conant,	Buckfield	900 20-21

Many of the above orchards are well worthy of a prize and the owners are deserving of congratulations for their success.

It is to be regretted that the prize offered by the Bowker Company of Boston was not awarded, but no orchard was deemed worthy that had fulfilled the conditions. It is hoped that Mr. Bowker may be prevailed upon to renew his offer for the contest which starts next spring.

EXPENSE ACCOUNT.

Date.	Hotel and garage.	Supplies.	Car fare.	Ferry.	Telephone.	Auto hire.	Justice.
August 17	$7 00	$ 40	$ 50	–	–	–	–
August 18	10 00	–	–	–	–	–	–
August 19	10 75	–	–	$ 60	–	$5 25	–
August 20	7 90	–	–	–	–	–	–
August 21	11 50	–	–	1 10	$ 10	–	–
August 22	7 00	40	–	–	–	–	–
August 23	10 75	–	–	–	25	–	–
August 24	12 25	–	–	–	10	–	–
August 25	5 00	–	–	–	–	–	–
August 26	12 00	–	–	–	–	–	–
August 27	8 60	40	90	–	20	–	$ 25
	$102 75	$1 20	$1 40	$1 70	$ 65	$5 25	$ 25

Production, One Barrel, 5 yrs. set.

Total	$113.20
A. A. Conant for use of machine..................	110.00
W. H. Conant, salary............................	44.00
Total expenses	$267.20

CONCLUSIONS.

The contest demonstrates fully the adaptability of Maine in its different counties to the production of the various varieties of apples and to their early and profitable bearing.

Careful attention to proper orchard practices was a much greater factor with the successful contestants than natural conditions.

We believe that the contest has done much to advance the standard of orcharding in the state and that growers who were not contestants have benefited materially.

We feel that the contest should be continued for better fruit for Maine.

Apple Shipments 1913 and 1914.

In pursuance of the policy started last year relative to estimates of our commercial production, the various transportation companies were asked to supply a statement showing the actual number of barrels of apples accepted by their roads from August, 1913, to August, 1914.

By taking out the barrels transferred from one road to another, it was found that the actual commercial shipment was three hundred and forty thousand nine hundred and eighty (340,980) barrels. This was forty thousand (40,000) barrels in excess of the estimate made by the Bureau of Horticulture in the last report, due to the scarcity of fruit throughout the country and the active demand for salable fruit of all grades. It would appear at this time that the 1914 production was in excess of that of 1912, when six hundred and eighteen thousand (618,000) barrels were shipped; however, the unsettled market conditions and the failure of buyers to make an active canvass of the state will keep the commercial output down to about six hundred thousand (600,000) barrels. Such will probably be the case, notwithstanding the fact that the fruit this year is of higher quality and better grade than for many seasons. Of the data available in the office North Jay was the heaviest shipping point with 12,465 barrels, West Paris was second with 11,300, Union, third, with 8,700, Wilton, fourth, with 8,003, and Norway, fifth, with 6,925. South Paris, Winthrop and some of the other shipping points which usually have an output of 20,000 barrels all fell below the 6,000 barrel mark. Outside of Maine the production was unusually heavy for this season. The Federal Government has made an estimate of 70,000,000 barrels, although this is greatly in excess of the figures of other compilers. Conservative estimates place the 1914 crop between 50,000,000 and 60,000,000 barrels. The fact that western New York had a large crop of fruit had a tendency to depress the eastern markets early so that prices have been inferior thus far. The western box holdings at the end of the present season, as estimated by the Northwest Fruit Distributors, are approximately 3,000,000 boxes; as estimated by the New York dealers, from 5,000,000 to 7,000,000 boxes. This shows plainly that it will take a very active market to handle the remainder of the apple crop advantageously to the producers.

The following data were collected from the various transportation companies:

BARRELS OF APPLES SHIPPED AUG., 1913–AUG., 1914.

†Maine Central Railroad		248,850
Grand Trunk		70,979
Eastern Steamship Corporation		27,850
*Bangor & Aroostook Railroad Company		13,467
*Georges Valley Railroad		8,600
Sandy River & Rangeley Lakes Railroad		4,430
Bridgton & Saco River Railroad		3,100
*Bangor Railway & Electric Company		2,939
*Kennebec Central Railroad Company		17
Boston & Maine		20,608
York Harbor & Beach R. R.		651
		401,491
*Transferred to another road	25,023	
†Maine Central R. R. transfer to Grand Trunk	35,488	60,511
Actual total shipments		340,980

Conclusion.

Lack of space makes it impossible to give a more extended report at this time, and many things of interest have had to be sacrificed. Little attention has been given to insects and diseases except in a very general way and the next report will cover this phase of the work in detail.

I wish to express my appreciation of the assistance given the bureau by the Experiment Station, College of Agriculture, apple growers and the various fruit organizations. I wish especially to express my appreciation of the consideration and help given me by you during the year.

Respectfully submitted,

A. K. GARDNER,
Horticulturist.

Bureau of Horticulture.

REPORT OF THE SPECIAL FIELD AGENT IN CHARGE OF GYPSY MOTH WORK.

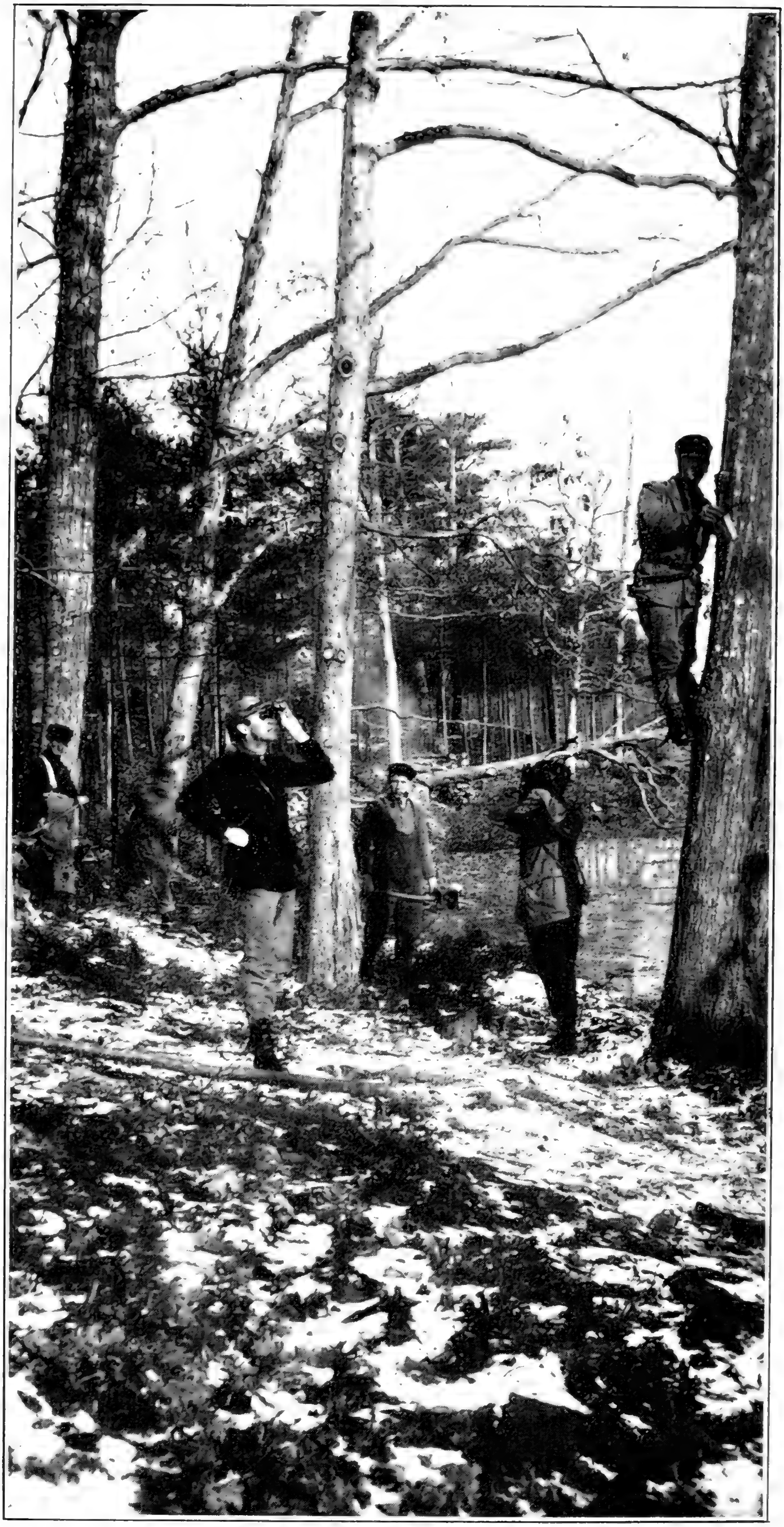
Hon. John A. Roberts, Commissioner of Agriculture.

SIR:—I have the honor to herewith submit my annual report as special field agent in charge of the gypsy moth work.

The general work of this department this year may be classified under two heads,—the parasite laboratory department and the field department, the former employing about ten men and the latter about fifty men. Owing to the fact that there has been a great diminution in the numbers of the two pests this past winter, 1913-14, the work of both departments has been carried on with particular earnestness and effort. The reduced number of the pests has made this season a very opportune one to further deplete the armies of our enemies, the leaf eating insects. All that this department can ask of the people at the present time is that they pay particular attention to the spraying of their trees the coming spring. This is the most effective method they can employ, and at the present time, with the moth situation so well in hand, spraying would accomplish such a further reduction in the pests that we could look forward to an almost complete control of both the gypsy and brown-tail moths in a few years.

From all over the state reports have come to this office stating that the flight of brown-tail moths this year is anywhere from one-fourth to one-half of the flight of last year. In Auburn, Lewiston, Brunswick, Augusta, Portland, Biddeford and Saco the flight was hardly noticeable compared with that of last year; while in the northern extremities of the infested territory where the brown-tail moth foreboded much harm for this season, it was difficult to find a brown-tail moth in flight.

Now as to the work of this department during the year. In the parasite laboratory we have had a very successful season. Greatly encouraged by the results of last year's work in this department, we have bred and liberated large numbers of parasites throughout the state. We have accomplished more than



Scouting for Gypsy Moth.

twice the work this year as far as numbers go. We have successfully bred large numbers of the Apanteles lacteicolor and Meteorus versicolor, parasites of the brown-tail caterpillars; the Compsilura concinnata and Calosoma sycophanta, parasites of the gypsy moth caterpillars; also two small colonies of the egg parasite of the gypsy moth, the Shedius kuvanæ, were reared and liberated as an experiment.

I firmly believe that the results of the parasite work will be easily recognized by all before another year has passed. I also believe that the parasite method of combating our two pests is far more effective than any other method and should be encouraged by the people of the state to a greater extent.

As to the field work, crews have been stationed this year throughout the most heavily infested parts of the state, and the fight has been waged by every known method of hand work. Beginning in the winter the egg clusters of the gypsy moth were found in quantities and destroyed by painting with creosote. Millions of the pests were thus exterminated. Then an early spring spraying was accomplished which further depleted the numbers of both the brown-tail and gypsy moths and prevented their further distribution. A little later trees were burlapped and the caterpillars of the gypsy moth were hunted down and destroyed by thousands by cutting and crushing.

During August a great deal of spraying was done which destroyed millions of both the gypsy and brown-tail caterpillars. I wish to lay particular stress upon the necessity of public coöperation in this branch of the work. I have already cited the reasons for spraying and it is now the duty of every property owner to do his share.

One more phase I have not touched as yet. During the summer months the bacterial disease Flacherie, better known as the wilt disease, was found to be working in the western part of the state among the gypsy moth caterpillars. Millions of caterpillars have been killed by this disease, especially in York, Kittery, Eliot and South Berwick. Plans for another year are not yet formulated owing to the change which will occur in the field agent's position, but with the right kind of support from the legislature and public in general, there is an excellent chance of having the brown-tail and gypsy moth problem well under control before this year's work and unusual success has passed from beyond our memory.

FIELD WORK FOR THE YEAR.

Scouting for egg clusters of the gypsy moth was begun early in the year and was continued until time for burlapping. Five bales of burlap were used in this work and over 800,000 caterpillars were taken and destroyed during the months of June, July and a part of August. The spraying operations were carried on more extensively than ever before. Seven tons of arsenate of lead were used with the most gratifying results.

The summer work finished on Sept. 15. Owing to lack of funds it was necessary to stop all work until Oct. 15, when the scouting was again begun and continued until Dec. 15. The scouting operations resulted in the finding and destroying of 1,273,860 egg clusters. In this work over 600 gallons of creosote were used.

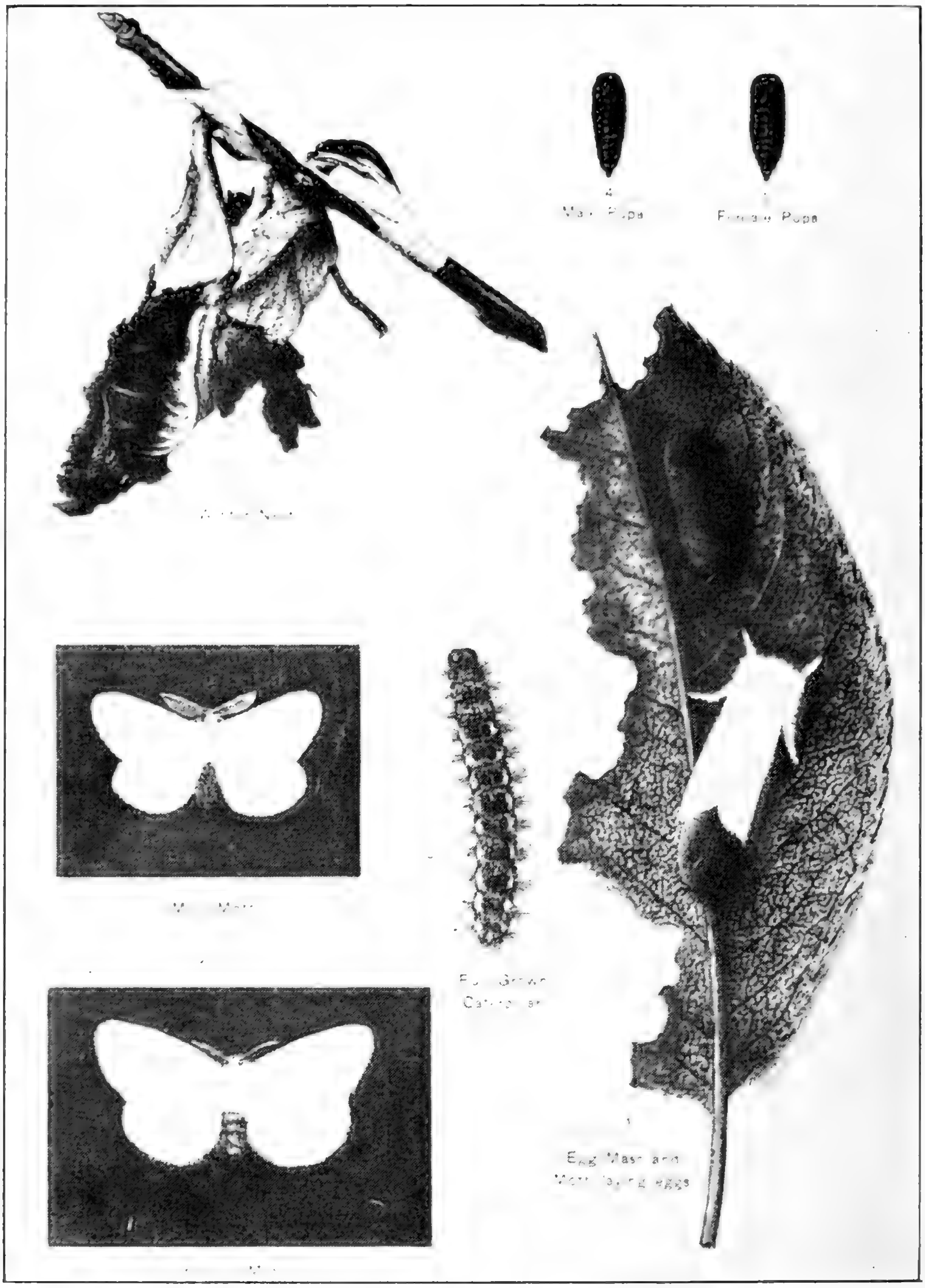
Forest fires in the western part of the state have destroyed a great many of the caterpillars. In addition to the spraying work done by the state, South Berwick, Sanford, Kennebunk, Gorham, Yarmouth, Wells and Lewiston have done a great deal with the machines owned by the towns and cities mentioned. There are now known to be 189 towns infested with the gypsy moth.

CORRESPONDENCE.

In addition to the work at the laboratory and in the field, a great deal of correspondence has been carried on by the field agent. During the year 1564 letters have been received and answered, all of which related to the proper methods of handling the gypsy moth, many of them reporting new infestations. In such cases an inspector has been sent to the person making such report with the purpose of educating such persons in the proper methods of taking care of the pest. By this method we have enlisted the support and help of a great many people and I believe that this service is the best that can be rendered to our citizens, as it helps them to take care of their orchards and shade trees in the best possible manner.

COLORED POST CARDS.

Having had a large number of colored post cards left from last year, the same have been sent through the mail to all parts of the state. These cards show the life history of gypsy and



Life History of Brown-tail Moth.
By F. W. Rane, Mass. State Forester.

brown-tail moths and the Calosoma beetle. These illustrated cards have served to clearly set forth the characteristics of each moth. Besides giving their natural color and size, the cards contained a brief description of each insect.

LECTURES.

During the year sixty-eight lectures have been given by the field agent before different societies, such as granges, schools and churches, as well as farmers' institutes. All of these lectures were illustrated with lantern slides showing the life history of both the gypsy and brown-tail moth, as well as the methods used in the field for the extermination of same.

FINANCIAL STATEMENT.

Appropriation for 1914	$30,000 00
Expenditures.	
Wages of field force	$24,367 50
Wages of laboratory force	2,518 62
Travel expenses field agent and two inspectors	1,576 17
Supplies for field work	936 26
Supplies for laboratory, including new building	446 84
Printing and binding	16 63
Insurance on laboratory buildings and supplies	28 50
Total expenditures	$29,890 52
Unexpended balance	109 48
	$30,000 00

PARASITE WORK.

The work of breeding parasites has completely changed the methods of fighting our insect enemies. It must not be thought that the task has been an easy one and without the aid of the government it could never have been accomplished. Millions of dollars have been expended in experimenting, and along other lines, in order to bring about present results. The work will be better understood when it is known that more than forty different kinds of parasites have been bred and tested in order to reach our present list of two or three that are really effective. In this work our government has received much aid from the entomologists of Europe and Japan, although in the final decision we have been obliged to rely on our own judgment. Many parasites that are effective in Japan are found to be worthless when transplanted to another climate and bred under different conditions. All of this knowledge has been worked out with infinite patience and care until the problem has well nigh been solved. The best results can only be accomplished when we have a series of parasites that will attack the moths at different periods of their life cycle. For example, one parasite should attack the egg cluster while another one should be bred for the pupa. This is known as the sequence theory, and on this problem the government experts are now working. The beetle cannot be depended upon to destroy the egg cluster of the gypsy moth, however destructive it may be to the caterpillar, but with a chain of parasites the work of extermination would be thorough and complete. While the Japanese parasites are by far the strongest and best that have yet been developed, what we really need is one that is exclusively American in its character and habits. This problem is being worked out and our own state laboratory is doing its full share in this labor. In Japan this has already been done and in that country they have a different parasite for every stage of the brown-tail and gypsy, from the egg clusters to the developed caterpillar.

There are two parasites for the brown-tail and these are known as the Apanteles lacteicolor and the Meteorus versicolor. The first named of these is the most destructive. Still another parasite destroys both the gypsy and brown-tail and the technical name of this one is the Compsilura concinnata. The life cycle of all three of these parasites is practically the same.

The Apanteles lacteicolor are first obtained from the government laboratory at Melrose Highlands and come as pupæ. About five hundred of these are placed in a perforated tin box and this box is fastened to a tree infested with brown-tails. Tar or tanglefoot is placed about the box to prevent ants and other insects from entering the little holes in the box and destroying the pupæ. In seven days the pupæ hatch and then emerge as small flies. Then begins the hunt for the brown-tail caterpillar and each female parasite deposits about one hundred and twenty-five eggs in the bodies of as many brown-tail moth caterpillars. The maggots resulting from these eggs feed on the vitals of the caterpillar until they enter the pupal stage and then again emerge as adult flies and repeat the process. It is the flies that sting the caterpillars and the life of these flies is about thirty days, during which time the work of depositing eggs under the skin of the caterpillar goes on. When this life work is finished the fly dies and the work of regeneration and resurrection goes on through eggs resting in the bodies of the caterpillars which have been stung. This is the life cycle of the brown-tail moth parasites.

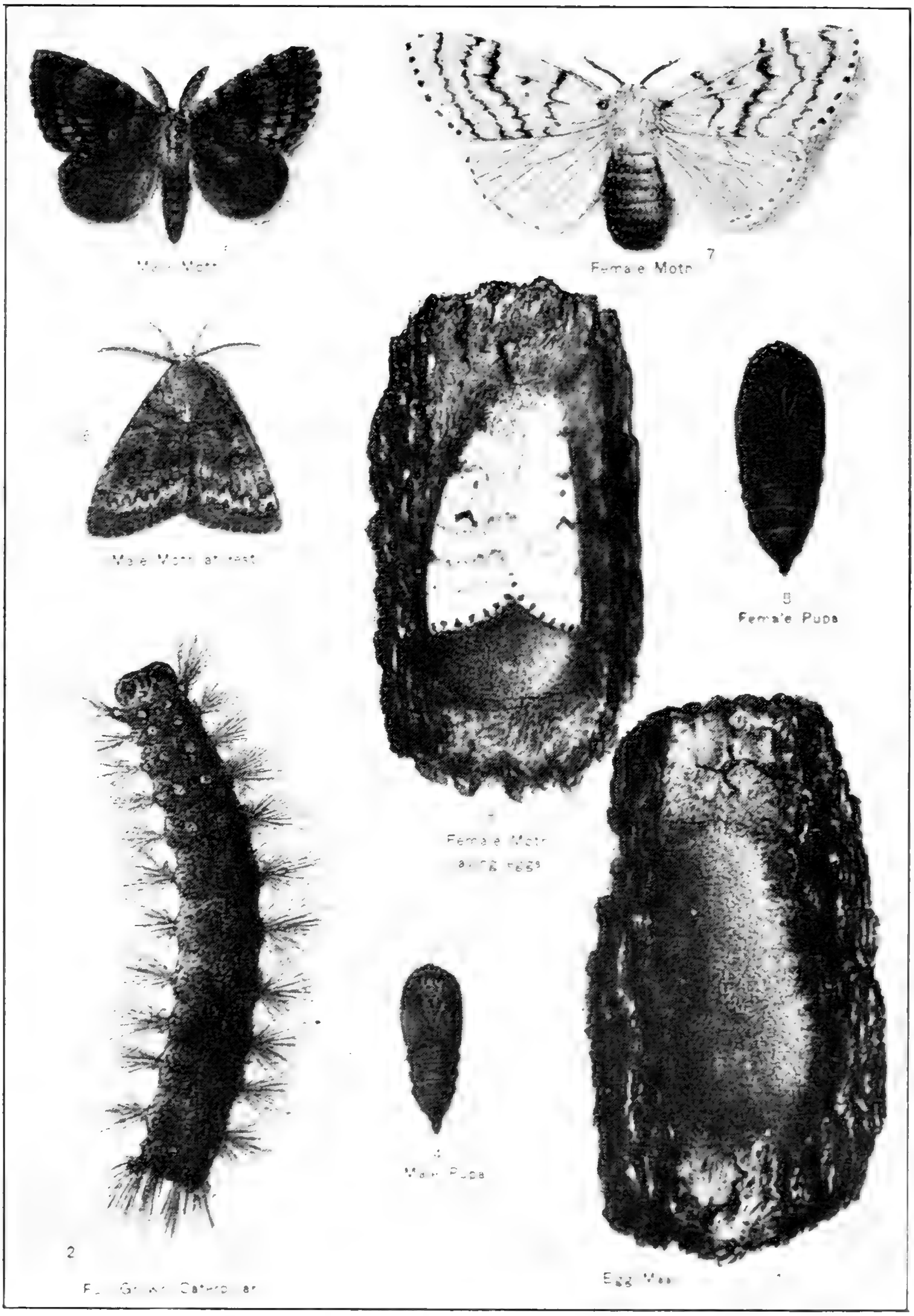
The gypsy moth parasite is known as the Calosoma sycophanta and is a beautiful green and gold colored beetle about an inch in length. This beetle is a powerful fellow and feeds through the lava and pupa stages of the gypsy moth and its hunt for them is unceasing. The parasite has long legs and can travel very fast. When it finds a gypsy it seizes it and rips open its vitals in a merciless manner, thus letting out the viscera or liquids of the body upon which it feeds. It is very predaceous in its habits and when no gypsies are to be found it will attack any insect in sight. One of these beetles in the laboratory has a record of killing one hundred and sixty-eight gypsy caterpillars in a day, and on the average a pair of beetles will destroy 6,000 caterpillars in a season.

This gypsy parasite has a life cycle which extends over two years, and like the June bug lays its eggs in the ground. It lives in the ground through the winter and the following spring emerges to begin its work of destruction. It is a great traveler and spreads out over a wide territory in search of food.

The following table shows the kind and location of parasite colonies in the state:

Town.	Colony Liberated.
Baldwin	Calosoma sycophanta
	Compsilura concinnata
Brunswick	Calosoma sycophanta
	Apanteles lacteicolor
Bar Harbor	Compsilura concinnata
	Apanteles lacteicolor
Belfast	Apanteles lacteicolor

Berwick	Calosoma sycophanta
Bowdoinham	Calosoma sycophanta
Brewer	Apanteles lacteicolor
Buxton	Apanteles lacteicolor
Camden	Apanteles lacteicolor
Cherryfield	Apanteles lacteicolor
	Compsilura concinnata
Clinton	Apanteles lacteicolor
Cumberland	Calosoma sycophanta
Dexter	Apanteles lacteicolor
	Compsilura concinnata
Ellsworth	Apanteles lacteicolor
East Lebanon	Calosoma sycophanta
East Waterboro	Calosoma sycophanta
Eliot	Schedius kuvanæ
Georgetown	Compsilura concinnata
Gorham	Apanteles lacteicolor
	Calosoma sycophanta
Gardiner	Apanteles lacteicolor
	Compsilura concinnata
Hermon	Apanteles lacteicolor
Knox	Apanteles lacteicolor
	Compsilura concinnata
Kittery	Schedius kuvanæ
Lisbon	Apanteles lacteicolor
Lt. Diamond Island	Apanteles lacteicolor
Monmouth	Apanteles lacteicolor
Newcastle	Apanteles lacteicolor
	Meteorus versicolor
Norway	Apanteles lacteicolor
North Yarmouth	Apanteles lacteicolor
Oldtown	Apanteles lacteicolor
	Compsilura concinnata
Oxford	Compsilura concinnata
Pittsfield	Apanteles lacteicolor
	Compsilura concinnata
Peaks Island (Portland)	Apanteles lacteicolor
	Calosoma sycophanta
Portland	Apanteles lacteicolor
	Compsilura concinnata
	Calosoma sycophanta



Life History of Gypsy Moth.
By F. W. Rane, Mass. State Forester.

Readfield	Apanteles lacteicolor
Sanford	Calosoma sycophanta
South Berwick	Calosoma sycophanta
Sullivan	Apanteles lacteicolor
Turner	Apanteles lacteicolor
West Baldwin	Calosoma sycophanta
Waterville	Apanteles lacteicolor
	Compsilura concinnata
Warren	Apanteles lacteicolor
Wells	Calosoma sycophanta
Winterport	Apanteles lacteicolor
	Compsilura concinnata
Wiscasset	Apanteles lacteicolor
Yarmouth	Compsilura concinnata
	Calosoma sycophanta
York	Calosoma sycophanta

GENERAL.

It will be seen by the foregoing table that we have increased the number of towns colonized from nineteen to forty-seven and in addition to the new towns we have strengthened the towns colonized last year. No one need fear retarding or interfering with these parasites by general extermination of their hosts in orchards, as the sites selected for colonization of these parasites have been selected in localities where the moth colonies will afford abundant food for their support until they become strong and well established. A larger building was erected with a capacity of one hundred trays, better ventilation and more light, and we were able to increase the number of colonies greatly during the year. If the parasite work is continued with the facilities at hand, all of the infested territory can be given protection, which ought to assist the field work very greatly.

In addition to the work on the gypsy and brown-tail moths we have been called upon several times to assist in the extermination of the elm leaf beetle and the army worm. In each case men from the department have been sent out to help in this work.

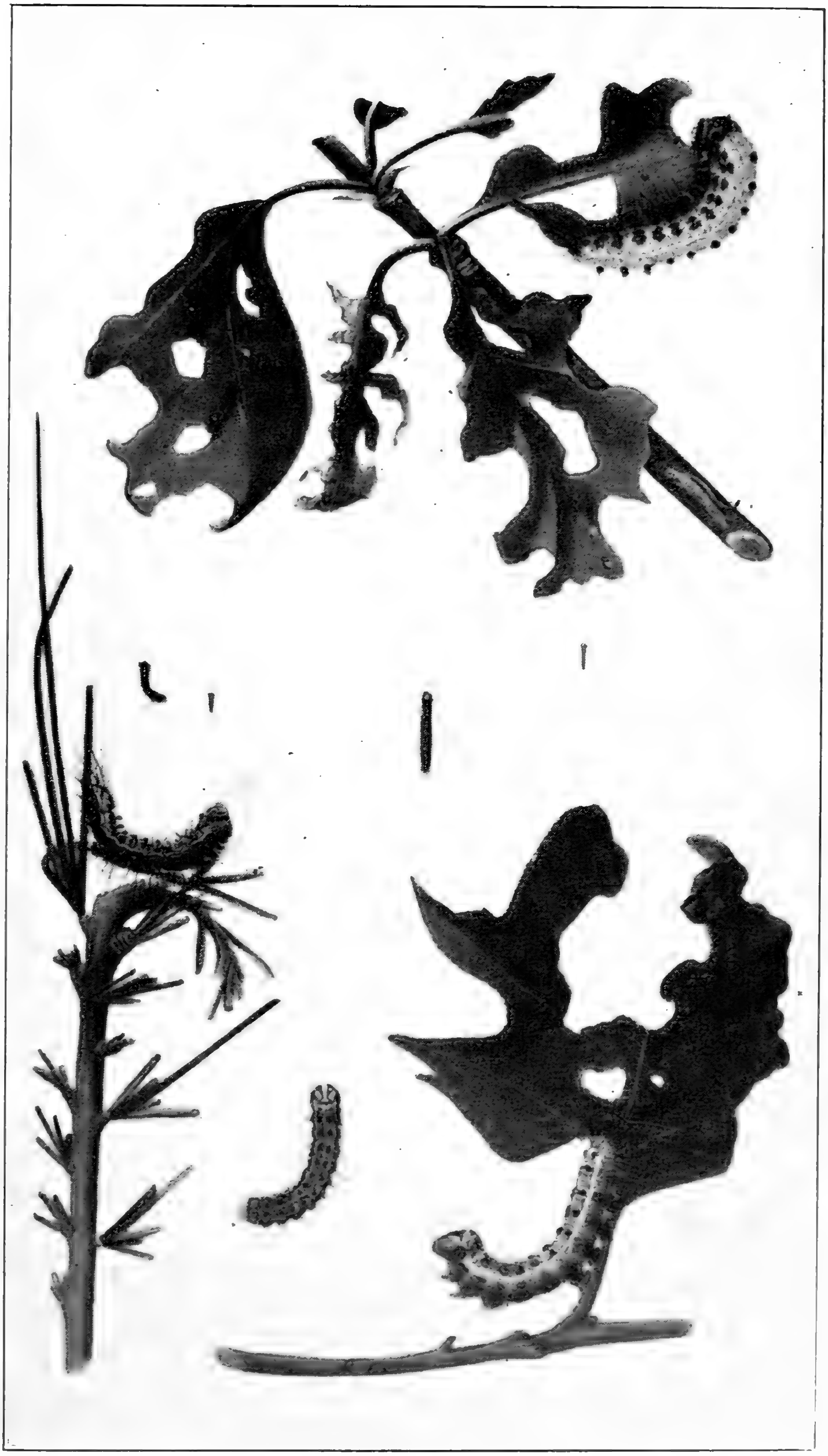
ACKNOWLEDGMENTS.

I am very much pleased at this time to acknowledge the help and advice received from many persons interested in the work. To the director and assistant director of the laboratory, inspectors, foremen and members of the field force I am glad to acknowledge my obligations for their loyalty to the department, and their efficiency, to which in no small measure is due the success we have obtained this year. And to you, Mr. Commissioner, allow me to express my sincere thanks for your kind coöperation in all matters pertaining to the work.

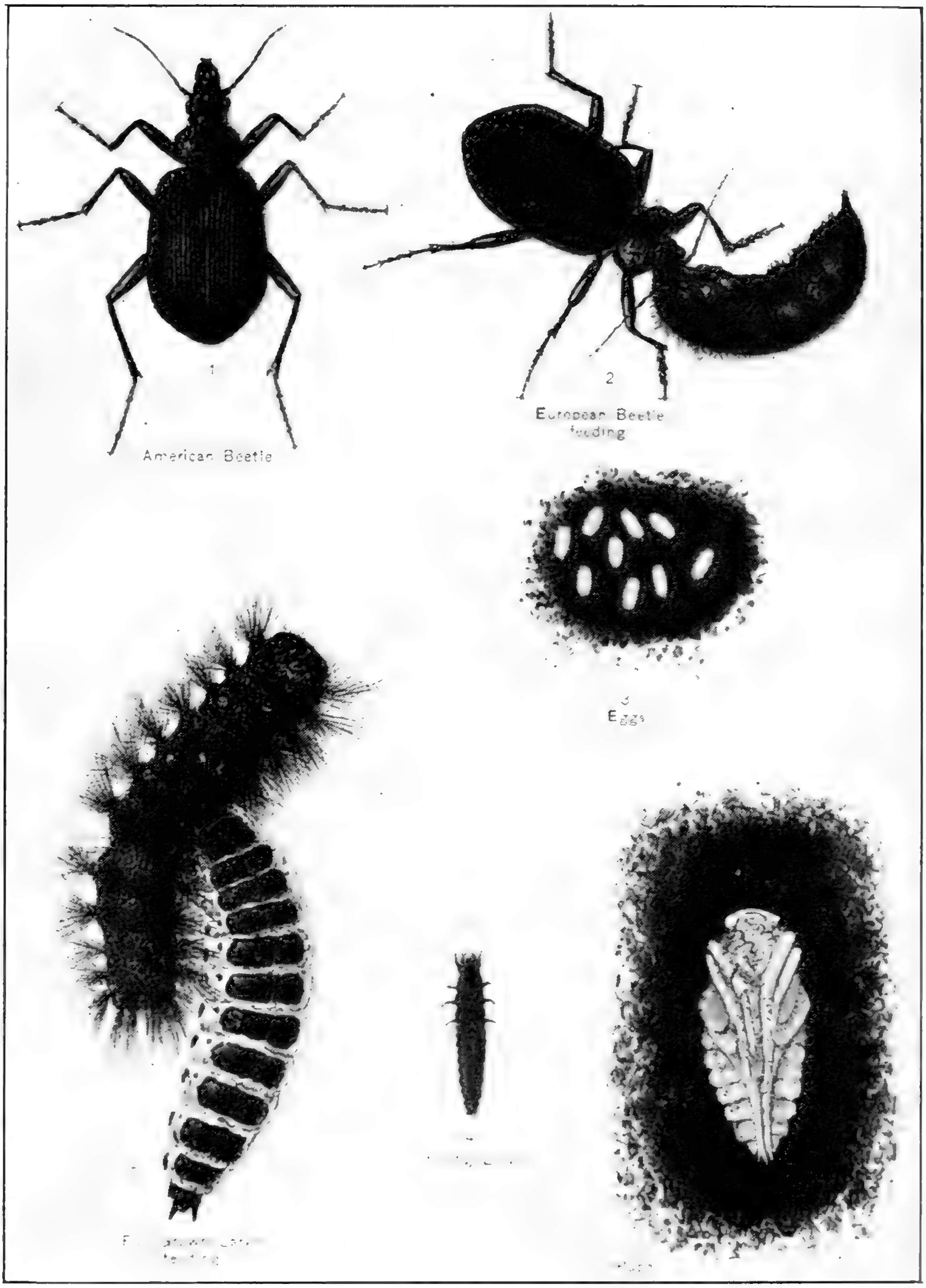
CONCLUSION.

Again I would emphasize the fact that unless larger appropriations are to be made by our legislature we must change our methods of work. I believe we could get better results by a campaign of education and the development of parasites than by the present methods. The funds for this work are far from ample,—$30,000 a year for both the laboratory and field work, and I would recommend the dropping out of some of the old methods and the use of a greater part of the appropriation for the breeding of parasites. Of course the experimental stage is not yet passed, but enough success has been achieved to warrant going ahead with the laboratory work.

EDWARD E. PHILBROOK,
Special Field Agent.



Feeding of gypsy moth caterpillar on apple, oak and pine.



Calosoma Sycophanta, Life History.
By F. W. Rane, Mass. State Forester.

REPORT OF DEPUTY STATE SEALER OF WEIGHTS AND MEASURES.

To the Hon. John A. Roberts, Commissioner of Agriculture:

I respectfully submit to you my second annual report as deputy state sealer of weights and measures, of the work done by this department.

I have visited about one hundred cities and towns during the past year, and I find the sealers very much interested in their work, and the traders, as a general thing, are very much pleased with the good work which is being performed by the sealers.

The greatest difficulty which we labor under is the changing of sealers every year. I am in hopes this present winter to have a law passed putting the local sealer and deputy sealers of weights and measures under civil service. We will then have made some headway, for a person holding the office of sealer is worth more the second year than he was the first and each succeeding year makes him better qualified to fill the office. All traders, too, that are brought in contact with sealers, do not like to have a new sealer every year.

The city and town officials in this state are complying very well with the law, although there are a few town officials who I am afraid will have to be brought into court before they can be made to understand that the law is going to be enforced impartially.

Last year we had reports from local sealers in regard to the work of sealing weights and measures in ninety-five cities and towns. This year we have reports from three hundred and thirty-nine cities and towns, an increase over last year of two hundred and forty-four. The following tables give a summary of the work done in these cities and towns:

REPORT FROM NINETY-THREE TOWNS AND CITIES.

Name of Town.	Number Tested.							Number Condemned.							Weights adjusted.	Scales adjusted.	Oil cans tested.	Oil pumps adjusted.	Milk cans tested.	Milk cans condemned.	Stores inspected.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.							
Abbot	9	25	-	3	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acton	3	10	4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Addison, Columbia, Harrington and Columbia Falls	94	281	83	103	21	22	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Albion	9	29	2	19	6	7	-	-	-	-	-	6	1	-	-	-	-	-	-	-	-
Alfred	17	47	20	14	1	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amherst, Aurora and Plantation No. 33	17	20	1	24	5	2	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Amity	2	2	2	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Andover	32	60	-	23	-	5	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
Anson	42	88	3	12	1	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Appleton	16	42	-	7	-	1	9	1	7	-	2	3	-	-	-	-	-	-	-	-	-
Athens and Cornville	4	43	-	7	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Auburn	364	815	21	9	-	21	2,468	4	-	2	-	-	1	51	26	9	-	-	-	-	-
Augusta	186	266	35	20	-	23	4,398	1	-	6	3	-	-	67	2	-	-	-	-	-	-
Baileyville	16	40	18	6	1	4	-	1	2	-	4	-	-	-	-	-	-	-	-	-	-
Bancroft	4	6	-	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bangor	498	1,038	98	126	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Baring	6	-	-	6	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bath	211	319	87	157	23	29	452	9	13	7	31	-	-	7	-	-	-	-	-	-	-
Belfast	142	410	72	39	38	27	64	1	6	5	-	7	-	9	-	-	-	-	-	-	-
Belgrade	28	-	2	16	1	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Belmont	6	12	4	12	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benton	11	16	4	4	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Berwick	19	32	8	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Bethel	57	4	1	-	2	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-
Biddeford	292	172	161	105	32	25	200	4	1	12	2	-	-	-	-	-	-	-	-	-	-
Bingham	34	-	3	15	5	11	415	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blaine	26	-	3	1	2	5	-	-	-	-	.	-	-	-	-	-	-	-	-	-	-
Blanchard	3	12	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bluehill	76	168	48	54	14	20	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Boothbay	13	33	3	8	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Boothbay Harbor	49	112	-	-	-	-	-	6	4	-	-	-	-	-	-	-	-	-	-	-	-
Bradley	12	31	6	5	2	5	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brewer	55	100	10	12	3	2	1,200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bridgewater	35	46	-	6	7	10	98	4	-	-	-	-	-	3	-	-	-	-	-	-	-
Bridgton	9	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brighton	2	13	-	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Brooks	28	49	-	21	5	9	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Brooksville	33	46	17	40	13	9	-	3	4	1	5	1	-	-	-	-	-	-	-	-	-
Brownfield	55	125	18	36	5	17	-	7	1	1	-	3	1	-	-	-	-	-	-	-	-
Brownville	37	70	5	26	10	18	-	5	3	-	-	-	-	-	-	-	-	-	-	-	-
Brunswick	132	100	49	44	70	3	22	2	-	-	-	1	-	-	-	-	-	-	-	-	-
Buckfield	32	104	8	31	4	6	-	-	-	2	3	1	1	-	-	-	-	-	-	-	-
Bucksport	70	103	23	48	9	15	-	6	-	5	7	4	4	-	-	-	-	-	-	-	-
Burnham	15	48	-	17	2	5	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Buxton	36	76	8	14	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calais	110	2	-	67	-	9	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-
Cambridge	6	13	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Canaan	15	39	6	9	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Canton	45	97	9	19	5	4	-	19	6	6	5	-	-	-	-	-	-	-	-	-	-
Cape Elizabeth	18	54	5	9	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caribou	25	42	-	8	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carmel	9	-	-	7	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carratunk	8	-	1	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cary	5	-	1	3	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-
Casco	27	-	5	6	4	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-
Castine and Penobscot	56	14	35	47	5	16	154	3	-	5	2	2	1	-	-	-	-	-	-	-	-
Chelsea	5	10	4	4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Cherryfield	29	50	15	25	9	6	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Chester	9	25	8	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chesterville	8	30	-	2	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
China	41	109	8	31	10	13	-	4	-	6	3	8	2	-	-	-	-	-	-	-	-
Clinton	14	32	14	9	-	7	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Concord	6	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Connor	5	-	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cooper	4	-	-	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corinna	20	92	-		-	-	-	2	6	-	-	-	-	-	-	-	-	-	-	-	-
Cornish	24	-	4	7	6	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cranberry Isles	14	8	5	12	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crystal	7	22	-	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cumberland	40	35	-	3	-	5	-	8	5	-	-	-	-	-	-	-	-	-	-	-	-
Danforth	21	55	7	16	9	4	-	2	2	-	6	-	-	-	-	-	-	-	-	-	-

REPORT FROM NINETY-THREE TOWNS AND CITIES — Continued.

Name of Town.	Number Tested. Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.	Number Condemned. Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.	Weights adjusted.	Scales adjusted.	Oil cans tested.	Oil pumps adjusted.	Milk cans tested.	Milk cans condemned.	Stores inspected.
Denmark	19	47	-	23	1	5	-	1	-	-	2	1	-	-	-	-	-	-	-	-	-
Dennysville	9	7	7	13	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Detroit	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dexter	22	-	-	1	-	-	237	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Dresden	23	-	9	17	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
East Livermore	62	-	-	11	-	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Easton	39	78	-	38	3	13	-	4	-	-	4	-	3	-	10	-	-	-	-	-	-
Eastport	131	325	102	143	32	22	125	4	1	-	10	-	-	-	-	-	-	-	-	-	-
Eden	166	-	44	75	5	38	419	3	-	5	17	1	-	6	-	-	-	-	-	-	-
Edmunds	2	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eliot	31	65	9	11	-	11	140	2	5	-	-	-	-	-	-	-	-	-	-	-	-
Elliottsville	4	9	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Enfield	23	65	11	33	8	9	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Etna	9	-	-	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Eustis	24	67	-	5	4	10	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Fairfield	37	96	16	18	1	10	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Falmouth	30	41	21	5	3	9	72	1	-	4	2	-	-	-	10	-	-	-	-	-	-
Farmington	74	54	3	41	33	10	41	3	-	1	1	-	-	-	-	-	-	-	-	-	-
Forest City	5	6	4	4	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Fort Kent, St. John, St. Francis, Allagash, Wallagrass and Frenchville	174	211	11	53	60	53	36	37	4	2	25	35	12	-	158	66	-	18	-	-	-
Foxcroft	60	105	9	19	-	11	-	3	3	-	-	-	1	-	-	-	-	-	-	-	-
Frankfort	9	24	-	4	3	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-
Franklin	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Freedom	10	35	2	13	4	4	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-
Freeport	48	7	6	7	5	6	1,000	1	-	1	-	-	-	-	-	-	-	2	-	-	-
Fryeburg	73	149	16	22	11	9	-	8	-	-	-	7	-	-	-	-	-	-	-	-	-
Gardiner	44	161	12	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Garland, Bradford, Corinth, Charleston and Exeter	46	125	2	16	16	11	-	3	-	-	1	4	-	-	-	-	-	-	-	-	-
Georgetown	40	54	20	77	3	2	-	7	-	2	15	1	-	-	-	-	-	-	-	-	-
Gilead	10	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Glenburn	7	20	5	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gorham	57	10	-	-	-	-	34	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Gouldsboro	48	126	59	50	10	21	254	-	-	4	2	4	-	6	-	-	-	-	-	-	-
Gray	36	87	16	31	6	7	-	-	-	3	1	-	2	-	-	-	-	-	-	-	-
Greenbush	9	37	6	27	1	3	-	-	-	-	3	-	-	-	3	2	-	-	-	-	-
Greene	14	26	-	12	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Greenville	47	85	17	30	14	15	-	1	-	1	2	1	-	-	-	-	-	-	-	-	-
Guilford	27	80	-	15	10	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hallowell	51	62	7	44	3	11	36	-	-	-	15	-	-	-	-	-	-	-	-	-	-
Hancock	14	29	-	18	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Hanover	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harmony	24	56	2	8	6	4	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-
Harpswell	37	-	13	29	9	5	-	2	-	-	3	-	1	-	-	-	-	-	-	-	-
Harrison	36	68	22	38	9	1	63	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Hartland and St. Albans	40	89	-	10	-	6	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Haynesville	6	9	3	3	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Hebron	23	54	7	25	3	3	-	7	-	-	8	1	-	-	-	-	-	-	-	-	-
Hermon	17	51	-	12	1	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hiram	33	-	12	22	5	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hollis	10	33	14	-	2	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Houlton	122	50	11	55	-	19	716	4	4	10	-	-	6	5	-	-	-	-	-	-	-
Howland	9	16	6	23	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hudson	13	23	1	10	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Hurricane	4	17	6	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Industry	10	33	-	7	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Island Falls	22	20	4	8	12	9	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Islesboro	23	49	4	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jackman	13	37	-	2	2	1	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-
Jackson	8	31	1	7	6	6	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Jay	33	41	1	11	-	8	167	17	-	-	5	7	1	24	-	-	-	-	-	-	-
Jonesboro	5	4	9	6	2	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Jonesport	67	172	13	112	12	13	237	15	5	4	33	1	-	13	-	-	-	-	-	-	-
Kenduskeag	17	57	-	22	4	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kennebunkport	16	47	6	-	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kingfield	18	10	4	16	2	3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Kittery	41	82	5	9	1	11	324	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Knox	7	20	4	5	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lagrange	20	56	10	22	6	9	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Lamoine	7	22	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lebanon	12	28	4	-	1	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Lee	8	21	5	5	4	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-

REPORT FROM NINETY-THREE TOWNS AND CITIES — Continued.

Name of Town.	Number Tested.							Number Condemned.							Weights adjusted.	Scales adjusted.	Oil cans tested.	Oil pumps adjusted.	Milk cans tested.	Milk cans condemned.	Stores inspected.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.							
Leeds	25	46	–	14	6	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Levant	7	20	–	8	3	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lewiston	238	18	46	6	4	–	144	4	–	–	–	–	–	6	–	–	–	–	–	–	–
Liberty	13	30	5	7	7	4	–	4	–	–	–	2	–	–	–	–	–	–	–	–	–
Limerick	19	42	14	14	4	6	–	5	–	–	2	1	1	–	–	–	–	–	–	–	–
Limestone	62	72	1	27	8	10	–	4	–	–	–	2	–	–	–	–	–	–	–	–	–
Limington	13	21	7	13	6	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Lincolnville	21	90	5	10	5	4	–	3	15	–	–	4	–	–	–	–	–	–	–	–	–
Linneus	5	2	1	5	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lisbon	71	10	5	10	5	2	–	2	2	–	–	2	–	–	–	–	–	–	–	–	–
Litchfield	14	–	–	10	3	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Littleton	18	54	–	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Long Island	4	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Long Pond	3	8	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lovell	27	54	7	27	2	5	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Ludlow	2	3	–	2	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lyman	5	10	5	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Machias, Wesley, Cutler and Marshfield	12	8	14	12	7	7	–	3	2	1	–	3	–	–	–	–	–	–	–	–	–
Machiasport	6	8	4	2	2	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Madawaska, Grand Isle and St. Agatha	83	282	–	38	2	20	–	7	2	–	2	–	–	–	–	–	–	5	–	–	–
Madison	55	109	–	11	22	4	9	4	3	–	–	–	–	1	–	–	–	–	–	–	–
Manchester	–	–	–	–	–	–	720	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Marion	–	2	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mars Hill	49	–	4	1	2	6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Matinicus Isle	5	11	10	2	2	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mattawamkeag	13	21	7	6	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mechanic Falls	48	12	4	26	12	16	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–

Meddybemps	5	–	–	7	1	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–
Medford	8	22	2	10	1	4	–	1	5	2	–	–	–	–	–	–	–	–	–	–	–
Milbridge	26	14	12	10	3	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Milford	18	26	7	12	2	4	–	3	5	–	–	–	–	–	–	–	–	–	–	–	–
Millinocket	23	24	8	12	1	7	912	2	–	2	–	–	2	–	–	–	–	–	–	–	–
Milo	66	178	16	33	17	27	–	5	2	–	–	–	3	–	–	–	–	–	–	–	–
Minot	23	31	5	11	2	6	–	4	–	–	–	–	–	–	–	–	–	–	–	–	–
Monmouth	45	103	–	36	5	2	–	1	5	–	–	1	–	–	–	–	–	–	–	–	–
Monson	37	54	6	14	7	11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Monticello	38	104	18	30	9	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Montville	7	20	2	1	2	4	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
Moose River	2	9	–	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Morrill	7	18	–	2	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mt. Desert	82	94	19	36	14	14	88	4	3	–	–	1	–	–	–	–	–	–	–	–	–
Naples	19	5	15	18	5	3	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Newfield	18	–	19	19	3	7	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–
New Gloucester	32	41	4	35	5	10	42	2	–	1	1	–	5	–	–	–	–	–	–	–	–
New Limerick	7	–	1	1	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Newport	10	5	–	2	–	–	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–
New Sharon	12	30	6	12	3	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
New Sweden	31	–	–	20	–	8	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
New Vineyard	5	13	–	–	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	–	–
No. Appleton	4	3	1	–	4	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
North Berwick	33	–	–	4	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
North Haven	26	52	10	43	2	8	–	1	–	–	10	–	1	–	–	–	–	–	–	–	–
North New Portland	32	57	–	20	4	9	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–
Northport	13	48	4	12	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Norway	90	–	–	–	–	–	182	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Oakland	30	86	6	42	2	2	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–
Old Orchard	134	136	58	59	19	18	–	18	–	2	–	–	–	–	12	–	2	–	–	–	–
Old Town	181	176	80	95	11	23	–	23	–	6	13	–	3	–	–	–	–	–	–	–	–
Orient	2	4	2	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Orland	21	34	24	14	9	1	4	1	–	–	3	–	–	–	–	–	–	–	–	–	–
Otis	1	6	–	6	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Oxford	26	92	17	46	9	4	60	2	–	–	4	–	–	2	–	–	–	–	–	–	–
Palermo	6	21	3	4	3	2	–	–	–	3	–	3	–	–	–	–	–	–	–	–	–
Palmyra	3	6	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Paris	41	13	–	4	–	5	288	4	–	–	2	–	–	72	–	–	–	–	–	–	–
Passadumkeag	7	15	12	7	5	4	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–
Pembroke	19	20	30	29	5	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Perry	42	74	31	32	12	9	–	2	–	–	2	1	2	–	–	–	–	–	–	–	–
Peru	14	24	2	6	4	10	–	2	–	–	–	3	2	–	–	–	–	–	–	–	–
Phillips	44	62	–	14	12	8	–	4	6	–	2	1	1	–	–	–	–	–	–	–	–
Pittsfield	43	60	10	17	2	3	–	–	–	–	7	–	–	–	–	–	–	–	–	–	–
Pittston	13	6	10	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

REPORT FROM NINETY-THREE TOWNS AND CITIES—Continued.

Name of Town.	Number Tested.							Number Condemned.							Weights adjusted.	Scales adjusted.	Oil cans tested.	Oil pumps adjusted.	Milk cans tested.	Milk cans condemned.	Stores inspected.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.							
Plymouth	7	-	-	5	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Poland	64	220	8	28	6	9	-	7	2	1	12	-	-	-	15	12	-	4	-	-	-
Porter	19	-	1	16	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Portland	1,541	2,606	100	32	-	3	1,221	66	-	4	3	-	-	-	-	-	134	-	1,157	32	720
Pownal	14	34	2	18	3	5	-	2	5	-	-	-	-	-	-	-	-	-	-	-	-
Princeton	23	31	7	10	9	8	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Prospect	9	27	3	9	6	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Randolph	19	39	19	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Rangeley	40	-	-	34	11	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rangeley Plantation	6	-	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Raymond	15	7	13	20	4	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Richmond, Bowdoinham, Bowdoin and Perkins	126	319	54	120	11	4	340	4	-	4	14	-	-	-	-	-	-	-	-	-	-
Ripley	11	25	-	7	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rockland	413	1,004	41	-	-	6	-	-	-	-	-	-	-	-	-	-	46	-	15	-	-
Rome	5	20	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Roque Bluffs	3	2	4	3	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Saco	86	167	98	64	11	14	-	5	-	4	-	-	-	-	-	-	-	-	-	-	-
Salem	5	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sanford	342	1,598	56	211	7	26	7,284	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Sangerville	8	24	-	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Searsmont	14	37	-	8	3	6	-	1	-	-	-	-	-	-	-	-	-	3	-	-	-
Searsport	60	-	23	30	8	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sebago	15	40	14	18	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sebec	22	46	3	41	3	5	-	3	-	2	4	2	1	-	-	-	-	-	-	-	-
Seboeis	4	14	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sidney	11	-	6	16	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Skowhegan	103	319	29	21	6	3	-	-	-	3	2	1	-	-	-	-	-	-	-	-	-
Solon	25	-	-	24	4	10	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Somerville	7	20	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Berwick	86	22	16	7	16	-	-	3	-	4	-	-	-	-	-	-	-	-	-	-	-
Southport	7	10	8	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Portland	124	716	218	197	-	43	3,107	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southwest Harbor	20	-	22	6	9	2	-	1	-	3	-	-	-	-	-	-	-	-	-	-	-
Shapleigh	27	48	18	8	2	8	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Sherman, Benedicta and Silver Ridge	48	-	-	44	16	9	3	2	-	-	-	-	1	-	-	-	-	-	-	-	-
Shirley	14	30	-	5	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Standish	55	114	46	32	4	10	-	1	-	2	2	-	-	-	-	-	-	-	-	-	-
Starks	6	20	-	3	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stetson	19	-	1	3	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steuben	17	62	24	16	7	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockholm	18	-	-	21	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockton Springs	20	33	-	6	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stoneham	5	6	1	6	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Stonington	18	43	7	45	7	4	44	-	-	-	11	-	1	-	-	-	-	-	-	-	-
Stow	5	2	-	3	-	1	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-
Strong	22	63	-	4	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Sullivan	9	-	8	11	5	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sumner and Hartford	12	26	10	15	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swan's Island	16	40	2	16	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swanville	9	40	-	7	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
The Forks	4	-	-	3	2	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Thorndike	15	54	-	3	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Topsfield	11	20	-	7	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Topsham	24	26	14	10	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turner	39	96	4	4	3	13	-	1	-	1	4	1	-	-	-	-	-	-	-	-	-
Troy	14	21	4	9	6	8	-	1	4	2	-	-	-	-	-	-	-	-	-	-	-
Unity	33	75	-	26	7	10	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Unity Plantation	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upton and Grafton	6	14	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Van Buren	66	-	-	6	9	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanceboro	14	35	18	16	7	2	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vassalboro	49	135	13	33	6	11	-	3	4	1	-	-	1	-	-	-	-	-	-	-	-
Verona	8	-	7	3	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Vienna	5	25	-	17	3	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
Vinalhaven	54	157	31	36	1	10	360	1	2	7	-	-	-	-	-	-	-	-	-	-	-
Waldo	5	6	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waldoboro	74	243	8	16	-	-	-	4	4	-	2	-	-	-	-	-	-	-	-	-	-
Wales	10	16	-	8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Warren	35	140	19	9	4	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Washburn, Mapleton, Perham and Castle Hill	62	98	4	30	11	17	-	3	-	-	-	7	-	-	-	-	-	-	-	-	-
Waterboro	37	85	7	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-

REPORT FROM NINETY-THREE TOWNS AND CITIES—Concluded.

Name of Town.	Number Tested.							Number Condemned.							Weights adjusted.	Scales adjusted.	Oil cans tested.	Oil pumps adjusted.	Milk cans tested.	Milk cans condemned.	Stores inspected.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Oil pumps.	Milk jars.							
Waterford	31	8	–	2	4	3	–	2	–	–	1	1	–	–	–	–	–	–	–	–	–
Waterville	141	172	4	12	–	–	981	8	–	–	4	–	–	–	–	–	–	–	–	–	–
Webster	30	36	8	14	4	4	4	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Weld	15	29	–	6	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Wellington	15	24	–	9	4	2	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–
West Bath	11	21	36	21	–	–	208	–	–	3	9	–	–	3	–	–	–	–	–	–	–
Westbrook	109	217	14	18	9	14	412	2	–	–	1	–	–	5	–	–	–	–	–	–	–
Westfield	16	–	–	–	1	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Whitneyville	1	6	4	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Willimantic	7	21	1	2	2	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Windham	25	17	15	23	6	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Windsor	14	41	7	37	3	4	–	–	–	6	2	3	–	–	–	–	–	–	–	–	–
Winn	19	6	5	6	4	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Winslow	36	66	17	36	–	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Winslow for Hollingsworth & Whitney Co.	49	199	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Winterport	38	106	24	30	4	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Winthrop	22	48	–	8	5	4	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Woodland	10	–	–	18	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Woodstock, Greenwood and Milton Plantation	46	45	3	10	4	3	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–
Woolwich	15	53	21	41	–	2	103	–	6	2	7	–	–	11	–	–	–	–	–	–	–
Wytopitlock	9	24	3	3	1	6	–	1	–	1	1	–	–	–	–	–	–	–	–	–	–
Yarmouth	49	10	10	14	5	7	–	4	10	–	–	–	–	–	–	–	–	–	–	–	–
Total	12,685	22,244	3,281	5,601	1,333	1,670	30,141	525	180	174	372	145	74	291	236	93	180	33	1,172	32	720

Last winter, in talking the matter over with you, we thought it might be a good idea to have a meeting of the local sealers from all over the state. I sent letters to them asking for replies if they would be able to attend such a meeting. As about one hundred said they would attend, I proceeded to make arrangements by having some speakers to give them a talk on weights and measures. We set the day for the meeting January 21, 1914, and Mr. Fischer of the National Bureau of Standards, Mr. Hanson, Commissioner of Weights and Measures of Massachusetts, Mr. Woolley, City Sealer of Boston, Mr. Moynihan, Jr., of Boston, and Mr. Connors, with the W. & L. E. Gurley Company of Troy, N. Y., formerly sealer of Cambridge for twelve years, agreed to be present. I am sorry to say that at the last moment we received word that Mr. Fischer and Mr. Hanson would be unable to be present. However, the meeting was held and it proved to be a success beyond all expectation. Although the day was very stormy about seventy-five of the local sealers were present. The meeting was called to order by myself, and the Commissioner of Agriculture, as State Sealer, presided.

Hon. William T. Haines, Governor of the State, made a short address, followed by the Hon. E. E. Newbert, Mayor of Augusta, who welcomed them to the city. The remarks of these gentlemen and others will be found in the following pages.

As we had about two hundred local sealers in the state, they thought it would be a benefit to them to have a state sealers' association. Therefore, during the day, the local sealers formed such an association, of which I had the honor of being made president. We have not as yet met together again, but we are in hopes to in the near future.

In conclusion, I wish to thank you for your kind advice and hearty coöperation in all matters pertaining to this office.

Respectfully submitted,

LEVI S. PENNELL,

Deputy State Sealer.

MEETING OF SEALERS OF WEIGHTS AND MEASURES.

A meeting of the sealers of weights and measures throughout the state was held at the State House, Augusta, Wednesday, January 21, 1914. Hon. J. A. Roberts, Commissioner of Agriculture, presided. Sixty-four of the sealers from the various towns and cities in the state were present.

The first address was given by Governor William T. Haines, as follows:—

Mr. Chairman; Gentlemen:—

I regret that I have not more time to be with you, for I feel that your work is an important one. When I took the oath of office as Governor, I found upon our statute books a law that was passed in 1911, by the previous legislature, providing that the sealing of weights and measures should be under the control of the Commissioner of Agriculture. There was no appropriation made to take care of this work, so nothing was done during the years 1911 and 1912. The act simply remained on the statute book as a law, without any power to enforce it. The last legislature took the matter up, and made an appropriation to take care of it through the Commissioner of Agriculture. This work is in accordance with the spirit of the age and the times, and the system of government under which we are living, and it is most proper that it should be done under the Department of Agriculture. Similar work is being done by the Federal Government, through the Department of Agriculture very largely, although they are now creating new departments. The agricultural classes of the country represent the great majority of the people. They are the people most interested in all these laws which regulate and control the business of the country, and it is very proper that the business should be controlled and regulated. What is more important than an honest dollar, that represents a hundred cents; or than sixteen ounces to the pound? Do you know of anything? The whole American people today are interested in a square deal; and if a square deal should not begin with a pair of scales, in the daily life, when we go to the grocery store, or any other store, I do not know where it should begin. You know it becomes very easy to get slack in all business matters. It becomes very easy to knock off an ounce here or an ounce there. You have seen the statements by which you have learned how much is taken off in ounces in the prepared foods. You will find the bulletins showing the short weights we have had in the past. Those things are not a square deal. In America a man should buy 16 ounces to the pound in package goods just as in other goods. Of course that matter is not especially within your regulation, but what is more important, is to see that the scales used in the stores and in other places in this state are right and weigh right. Of course not much has been said about this and not much is thought about it until attention is called to it. I hope but very little dishonesty in this line is being practiced in the different parts of the state. I trust our people are substantially honest, I believe they are, and yet I should be surprised if you did not tell me that you found in your experience many occasions which justified the wisdom of this statute. The highest function of government is to protect the people. We are all agents of these 742,371 people. They expect us to do our work in accordance with the statutes laid down. They make these statutes. They send their representatives into this hall and yonder hall to make the statutes. We are public servants, we never should forget it, and there is only one way for a public servant to do, the same as a private servant,—to do his work as he is employed to do it and do it right, in accordance with the tenor of the laws under which we live.

I congratulate you on the importance of your work. I know you will attend to it faithfully and impartially, and will see that everybody in the business of selling and dealing in goods does right by the public, gives them 16 ounces for a pound and full measure for a peck, a quart, a pint, a gallon or a bushel. I thank you for your attention to these scattered remarks.

Hon. J. A. Roberts.

Governor Haines has made some explanation of the transfer of the matter of the sealing of weights and measures from the Treasury Department to the Agricultural Department, and has told you that the last legislature made an appropriation for the work. After that appropriation was made the Commissioner of Agriculture appointed Mr. Levi S. Pennell of Portland as Deputy Sealer of Weights and Measures in the state. Mr. Pennell had been sealer of weights and measures in the city of Portland many years and came with high recommendations from leading citizens of that city. He immediately took up the work. It was required by the statute that every town should have a sealer and that every town should have a set of standards. His first work consisted in seeing to it that each town in the state did have a set of standards and that that set of standards was compared with the state standards, and he has been very successful in the work. The larger portion of the towns of the state have provided themselves with the required standards, sent them to the office here, and had them approved; and many of the towns, I think nearly 100, have made to Mr. Pennell the annual report required by the statute, of the work in their individual towns. So that the work is progressing; and while the Governor said that there might be people in the state who are not honest, and that would call for this sort of work, we must also consider that scales, for instance, which are used in a store day after day, and year after year, get out of repair and instances are known where men in business have sold goods for a long time and cheated themselves because the scales were out of repair.

I have the pleasure of introducing to you the next speaker, Mayor Newbert.

Mayor E. E. Newbert.

It is surprising to me to find so many men here representing the towns and cities of this state. Governor Haines has said a good many good things to us, and in his capacity as Governor of our state his presence here this morning is in itself a welcome to this convention. I need not as mayor of our little city extend to you a formal welcome because you know you are welcome. You are in the capitol; it belongs to you; it belongs to every citizen.

I have been interested in this matter of the sealing of weights and measures. I found upon our statute books a strong law, a good law, but it was not in operation. No attention was paid to it. Seven or eight years ago some aldermen of the city got scared because on looking up the statute they found the excessive penalty attached to the neglect of duty in this matter, and one of the most pleasant things I did when I became mayor, one of my first acts, was to appoint a sealer of weights and measures for the city, under the supervision of the Department of Agriculture. I chose a young man for the work, well qualified and willing, and he has done splendid work. I do not believe our weights and measures in this city had been sealed for 25 years. Our young man has gone everywhere until today all the weights and measures have been sealed, and all the milk bottles and cans of the milkmen have been sealed, with possibly one exception. While we expected some opposition, we have found that the merchants have met our sealer in a friendly spirit. The man who does an honest business has no objection to having a sealer come to his store to seal his weights and measures. This is the day of the square deal. We ought to get 16 ounces to a pound. We have a right to know that we are getting correct measure when we pay our money for molasses or any other article of food. This is a great movement. I hope it may be extended. Our state ought to take hold of it and the department ought to see to it that the state does take hold of it. I have read a great deal in the magazines in the past few years of the splendid work that the enthusiastic young men have done in the large cities of the land along this line, and I have seen great piles of measures that they have seized and stacked up for destruction. I do not quite know how far Mr. Pennell or Mr. Roberts can go in handling the hawkers, with their false bottoms of measures, false measures and tricky scales. If anything can be done in this city, when summer time comes and they begin to call their wares, it will be done. I believe you cannot appreciate as well as I can the enthusiasm of Mr. Pennell. I have seen him at close range. I know his enthusiasm in the work. I know how much he has meant to the young man in Augusta who took this job for me.

There are men who believe that the state should keep hands off from a lot of things. I do not believe it; I believe it should keep hands on. We believe in enforcement of law. When a statute is made in these chambers and signed by the Governor of Maine it ought to become effective, and local officials, whether in counties or cities or towns, have no other duty than to see that it is executed. It is the duty of the State of Maine to see to it that the people who spend their money in the stores receive full value.

I welcome you in behalf of the city as Governor Haines has welcomed you on the part of the state. This is a good beginning and I hope it will enlarge and embrace the whole State of Maine.

J. A. Roberts.

On behalf of the sealers gathered here I want to thank Mayor Newbert for his earnest words. I think that Mr. Pennell has in view, some time in the future, perhaps not this year, the formation of an association of sealers in the state. One of the difficulties at the present time in the forming of such an association lies in the fact that the sealers are changed at the annual meeting of the towns and cities. The sealer of this year may not be the sealer of another year. I think it would be very interesting and desirable to have it understood in your towns, if possible, that the office of sealer should be continuous. It does require some expert knowledge and the man who has fitted himself for the work in a town should be continued in that work from year to year. Then an association could be formed and an annual meeting could be held, and this would be of great benefit to the state.

Mayor Newbert has referred to the great importance of this work and I assure him that so far as this department is able it will carry out the laws upon the statute books.

There is another matter of a similar nature about which you will allow me to speak at this time. You all understand the law regarding pure food and drugs, the law regarding feeding stuffs, fertilizers, fungicides and insecticides. The enforcement of that law has been transferred from the Agricultural Experiment Station at Orono to this department, and it means a good deal. It is a big business, larger than many people have an idea of, and it is along the same line of work as weights and measures. We have a corps of inspectors out in the field and they are trying to clean things up, trying to have the food protected from flies and from dirt. They are going into restaurants, bakeries, hotels and other places where food is manufactured and used for the table and trying to get them into better shape. They are going into the stores and looking after the display of fruits and candies and the various articles for sale, and trying to have them kept under the proper conditions so they may be healthful. This department bespeaks your good will in this matter. It is a very important one. We are reaching out and touching every individual in this state, and you recognize the fact that it is a delicate matter. We are liable to run into trouble and it is for that reason that I speak of this today. I trust that you sealers will work with us, that you will assist us. The inspectors when they go around in your town no doubt will get in touch with you. I believe they have been instructed to get in touch with the sealers of the towns and I hope you will assist them in their work,—that you will explain to the grocerymen they might meet the requirements of this law and the desirability of its being enforced for the protection of the people of the state.

Hon. Chas B. Woolley.

It gives me great pleasure to come here to the State of Maine, the home of the greatest statesmen that this world ever produced. I might mention the names of Thomas B. Reed, James G. Blaine and others that I can recollect, whose lives and memories are cherished in your hearts and will live until time is no more.

I presume that you expect to hear something relative to the procedure of testing and collaborating scales in Boston. We have what I believe is one of the best departments in the country. I might say, however, that prior to 1907 the department of weights and measures was in a deplorable condition. About that time we had a commissioner appointed in the State of Massachusetts, and then the department began to do the work that was expected of them; and today I am happy to say, and I believe it is true, that no other city in this country has a better department, that serves the public better or more efficiently than the department of Boston, or the department of Massachusetts. I am sorry that our Commissioner is unable to be present here today. He is unavoidably absent and I wish to say for him that his great desire was to meet you here. And I want to congratulate you on the number that you have present at your first convention. I want to say to the sealers who are congregated here that under the direction of my old friend, Levi S. Pennell, there is not the slightest doubt but that you will become as good sealers, if you follow out his advice, as there are in this country. It is only a matter of a year or two when you certainly will be proficient in your work. Do your work and do it well, become proficient, and you may have a call to something higher. I wish to speak now of the high talent which is sometimes, and I might say quite often, drafted from the sealer's department. I once had a man under me who was a sealer and whose light was hidden for a time in the humble yet extremely important duties of my department. But his light was hidden only for a short time. It became so luminous that it spread out and he became known throughout the country even to the far West. There was a call for the man of the hour, and I tell you, Mr. Commissioner and sealers of the State of Maine, that it was one of the pleasantest duties of my life when I subscribed to the honesty, sobriety and ability of that sealer and today he holds a position of high trust in one of the largest manufactories in the country. I speak of this by way of encouragement to you to persevere and become proficient in your work, and when the doors of opportunity are opened, be prepared to see that they are not closed before you enter.

In Boston we have a sealer, ten deputies, one clerk and a helper. Six of my sealers are continually performing their work, going from store to store, testing and sealing scales, balances, weights and measures. Two other of my deputies are continually upon the street on inspection work. Dr. Fischer came to Boston at one time and criticised our department because we did not do inspection work enough. I am convinced today that that is one of the most valuable assets of a department. We have tested and sealed in the last year 85,719 scales; adjusted 17,315; non-sealed, 115; tagged and condemned, over 4,000. Among those scales condemned, and on our work of inspection, we have seized and had surrendered to the department more than 1,500 scales; scales that were improperly constructed, scales that were conducive to fraud. They were scales known as the family type of scales. We have ridden the city of that variety of false scales. We could not seize scales except for evidence, but the law gives us a right to seize for evidence. By moral suasion we have gained the results which I speak of.

One of the most important things is the reweighing of coal in transit. Our law provides that the driver of the team must have a sworn certificate of weight and we have a right to intercept that team wherever we see it, call for the certificate of weight from a sworn weigher and take a copy; then if we desire, order him to the first public scale or the most convenient scale that has been sealed by our department and reweigh his load, after which he returns to the same scale and we get the tare; then we know whether his weights are correct or otherwise. In those coal reweighings our activity, together with the publicity that the press has given our work of coal reweighing and of prosecutions for the violation of the law in the sale of that commodity, in my opinion has saved the city of Boston in the last two years more than ten times the cost of our department, which is about $30,000 a year. The cases in court from year to year have been decreasing, which is highly gratifying to me, I assure you. We can go on the streets today, and spend three weeks patrolling the streets on inspection of the sales of different commodities, and I assure you it would be a very difficult thing to find one violation of short weight in the delivery of coal in Boston. Last summer in the hottest season Boston was the pioneer city in the suppressing of fraud in the sale of ice. We made a crusade in the month of July and found violations of from 40 pounds on the hundred to 600 pounds on the load. In three weeks we had corrected that fully, so that the public got more ice than they could get in the ice chest, and the poor people at the north end of the city, those who had their nickel and only their nickel to spend for ice, possibly for sick children, in many instances got 25 pounds for a nickel. So you see that the Department of Weights and Measures is one of the most valuable departments in any state or municipality. I believe it should stand in line, side by side with our schools, our churches and our courts of justice.

I do not wish to have you understand that a great majority of our merchants in Boston are dishonest, for I wish to make this statement,—and I hope you will become cognizant of the fact yourself, in your cities and towns—that the merchant in the great majority of cases is honest and intends to be honest. If there is a violation it is a mistake in a great many cases. And I want to say to you now, as I have had the experience, before you prosecute be sure to make an investigation and satisfy yourself that there is a malicious intent and a fraud. For you should remember, gentlemen, that the greatest asset that a man has in this world is an unsullied reputation. You take that from him and you take that which you never can return. You give him a court record that stands forever.

Perhaps you would like to know that we employ in our department five teams, in the general work of sealing, going from store to store. We also have a truck automobile which does the work for all the large corporations,—railroads, ice companies, coal firms, etc. I believe the largest capacity of scale we have is 200 tons. A great deal of work is necessary in order to do things right and remember you must have that which will assist you in doing it.

I wish you success. The Mayor of Boston, the Hon. John F. Fitzgerald, sends greetings to you, and his wishes that your convention might be a great success and that all future ones might be successful. I thank you.

A committee was appointed to take into consideration the advisability of the organization of an association, as follows: Richard J. Nugent, Portland; O. B. Frost, Augusta; John W. Gilmore, Bath; F. G. Willard, Auburn; Chas. W. Jack, Richmond.

At 11.30 A. M., after the adjournment of the morning session, a business meeting was held. The committee reported favorably on the organization of a state association. Mr. Nugent was selected for temporary chairman and Mr. Frost secretary.

Daniel J. Moynihan, Jr.

It is a pleasure to be present with you today. Since I have been called upon for a few remarks, I go back in memory to the days a few years ago, when Palmer, Woolsey, and the other boys were pioneers in this work in the United States. I have surveyed the field somewhat dispassionately and I feel that the forming of your association here today is opportune in many ways. You have many years of experience that you can draw from for the proper conduct of your work in the future. I wondered as I listened to the remarks here this morning if the sealers themselves ever really thought seriously as to the importance and the character of the work they are called upon to perform. There is no branch of the public service that touches more closely the elbows of the public each day than the office of sealer of weights and measures. There is no article of food, of clothing or of fuel but must be meted out equitably by some form of measurement, by some type of weighing or measuring device. Yet in the rendering of this service to the public, how little appreciation follows sometimes, from the very public you are attempting to serve. That is best illustrated by the fact that heretofore in many cities, and perhaps it is largely true in your state at the present time, the incentive is not created at the outset for men such as I see before me to become extremely enthusiastic over the proposition of being sealers of weights and measures. There has not been a uniform attempt made, up to within recent times, to elevate the position of sealer of weights and measures to the dignity to which it is justly entitled because of the character and importance of the work that is performed. The position itself must be made attractive to a sealer. The salary has got to be in keeping with the importance of the work he is called upon to perform. You must throw around the safeguards of civil service in order that he may be included within the embracing folds of that all important protection which guarantees faithful and honorable service. That we are assured can be accomplished and one of the first attempts to be made on the part of my good friends, Mr. Connelly and his friends, is to secure civil service protection for the sealers of the state of Massachusetts. Generally speaking, the sealers when they start out, without previous experience or training, have an idea that they are called upon to render a peculiar service to the purchasing public and therein they are liable to run into gross error; for you are not only called upon, as sealers, to render that character of service to the purchasing public, but you are also to protect the honest merchant; and you are to see to it that no action on the part of the sealer is going to operate in such a manner that it will seriously hamper or interfere with the channels of manufacturing. The sealer should have for his protection further, statutes so drawn and ordinances, in the cities, so framed that they will determine definitely for him just what the services are that he must render, and point out the manner in which such service is to be rendered, for the testing and verifying of all weighing and measuring devices. The act of testing becomes a very simple matter. It has been freely illustrated by perhaps one of the best experts on weights and measures in the United States, Mr. John Connors of the Gurley Co., Troy, N. Y. It is very simple in itself, the testing of one piece of apparatus to fit another, but there are many things which contribute to error,—carelessness, misuse, neglect,—a thousand things which can best be remedied by the sealer by attempting to get the best information as to types in use, etc., so that you can tell what would put them in such shape as would conform to your standards.

The field has been so thoroughly covered that I will not say much more. I only want to express my extreme pleasure in appearing before you. I came from a distance as a favor to a man who has his heart and soul in the work of the welfare of the weights and measures of the State of Maine and of the welfare of each and every sealer in the state.

I am very glad to have this opportunity, and very glad to endorse the sentiments expressed so well by my friend, Mr. Woolley, under whom I served many years ago. He was a man who would get the best of service rendered him because of the kind treatment he always gave his employees. This is the first opportunity I have had in public to pay the tribute of respect that I feel for Mr. Woolley. I can also say many good words for Daniel Palmer. We were in the work for years together.

Properly drawn statutes, and well defined lines of action under your city ordinances, will be found necessary. We found glaring inconsistencies in our laws. If a man was brought in to be prosecuted under a certain chapter or a certain clause, we would find there would be another one in contradiction to it and the case would be lost. This brings to my mind the fact that you are called upon to be prosecutors but not persecutors. I wish you all kinds of success with your association and sincerely hope I may have the pleasure of meeting with you again sometime in the future.

J. C. CONNORS.

I am very glad to be here today and see the sealers of Maine. It brings me back to the time, about seven years ago, that I went practically through the State of Maine and talked to everybody who would listen to me about weights and measures. I did not find many sealers here except in the larger cities. I came here to the State House, of course, and I was anxious to see the standards. I talked with Mr. Wiswell down in the Treasurer's office. He said, "Yes, we have standards," and he took me down cellar and showed me the old relics the state had possessed since 1840. Then I went around to the different towns, and if I could not find a sealer I went to see the Mayor or the Board of Selectmen. I would sit down and talk weights and measures until they would put me out. I found many people who said, "They are not giving short weight or measure in the State of Maine; we do not need sealers." Then I would take a fresh hold and start again.

The testing of scales and putting his seal on them is the lightest part of the duty of the sealer. He ought to find out whether the man is using the scales properly or not. When you are doing that you are doing some good. Of course the laws in the State of Maine that you are working under now are light laws, but they follow the line of the laws that have been passed in all parts of the country; and the sealers in other parts of the country are looking to Maine to see how these laws are working. They have been through their initiation and have been fairly well organized. But Maine is pretty near the last of the New England states to get organized, with the exception of New Hampshire.

I expected to see Dr. Fischer here because I know he wanted to tell you a good deal about the work in other parts of the country; to show you how much the work had amounted to, and how much the inspectors of weights and measures had travelled throughout the country. In Washington at this time they are looking for a good deal of national legislation. They want legislation there which will affect the whole country so that a bushel of potatoes in Maine will mean the same as a bushel of potatoes in Ohio. They want those laws made uniform. There is some legislation pending down there now, and it seems to me the sealers here ought to help on it. A law is pending there which will make the size of apple barrels uniform throughout the country. A barrel of apples now is likely to be almost any size,—nobody knows what it will be; one man has one size and another, another size. Another thing we are trying to get through is the standardizing or sealing of all weights and measures by the national government. The proposition now is that we take a scale and say we will seal it or we will not seal it, according to our individual judgment. In one city the scales are submitted to a board, which passes on them. In some states each sealer is told what to seal and what not to seal, and just how much to allow. The custom has been in the past for each state to make its own definite regulations, so the whole matter is confused. Now what we want is a national law passed which will place that under a board at Washington, so that when a scale is passed on and found to be of a correct type it shall be accepted in all parts of the country by the sealers, assuming that it is accurate. That is one of the things that some of you who are in touch with the congressmen can explain to them. If you can get these things it will help the weights and measures all through the country.

The Bureau of Standards at Washington is planning an aggressive campaign on weights and measures, providing they get an appropriation. They are asking for an appropriation of $100,000 simply for the weights and measures. Under the appropriation they have been working with some good has been done, in this way: They have built a tester car for testing railroad track scales and that is going to operate in all parts of the country, so that when Mr. Pennell wants a track scale or two or three or a dozen track scales sealed, he can call on the Bureau of Standards at Washington. There is not a sealer in the country who is properly equipped to test a track scale. That could be safely left to the Bureau of Standards if they could get the money for more cars. They also want to put out instructions to sealers throughout the country. They want to tell them how to test a scale with a small amount of weights and make the weights they have count in the best manner. They want to have a general clearing house for the sealers, where the sealers can get all the information they want; and to do these things of course they must have money, and they need all the influence they can get to secure this money. When you think of the appropriations made in Washington, you realize that $100,000 is a small amount there, and it seems to me that the very men interested in weights and measures throughout the country ought to work for that, because it means the betterment of each sealer. If we can get those funds I think the situation will be pretty clear, and all through the country we can get uniform laws.

At the beginning of this work in Massachusetts, fifteen or sixteen years ago, there were three or four of us, and we did not know where to go for information. There was no Bureau of Standards and the State Department was just starting. We would get together and ask each other what we should do in a given case. By and by we established a little routine, and that is how the work started. Massachusetts was the first state to start and now the movement has spread all over the country. With the exception of a few states in the South and New Hampshire, every state has a department, and these departments are doing good work. In the western part of the country they give the sealers more power when they pass a law. What they cannot write into the law they give the state sealer power to make regulations to cover, so that when he finds he hasn't a law he writes a regulation. They are not as conservative out there and it gives them a great lead so they can get hold of all these propositions that are troubling you today. In Minnesota the law says that the State Board of Railroad Commissioners shall issue rules and regulations from time to time that shall have the force and effect of law. If there is nothing on the statute book when any proposition comes up, they simply write a regulation. I do not know whether the State of Maine has given any power to the Commissioner of Agriculture on that line or not, but I think it is a good thing because it is impossible to frame a law which will cover all the points that will come up.

I want to say a few words on the sealers' work. My work on weights and measures has taken me all through the country and I have seen a good many sealers; and one of the great things that has always come to my mind is that the sealers do not think enough of themselves. Most sealers think this is a small job and they proceed to enforce the law in a small way. To my mind the sealer is the most important officer in the community, and there is no reason why he should apologize for doing the work. The position is just as important as you want to make it. I always had cards printed and when I went to a place I gave the man my card, and said, "I am the sealer of weights and measures; I have the control over your scales." If he had any packages done up I would test them out. If he had any baskets on the floor for delivery I looked those over to see how he was doing business. From time to time we would take a couple of weights in our pockets and walk around among the various places and see how the scales were being used. The sealing of these scales does not amount to a great deal. It does not make any difference what kind of a scale a man uses if he gives the customer full weight. That is what we are after,—to see that the customer gets full weight or measure. If the sealer will just drop in here and there and look at the scales, and look at the packages and see that they are full weight, it will accomplish a good deal. I know that the Commissioner of Agriculture, Mr. Roberts, and the Deputy Sealer, Mr. Pennell, will always back you up in anything you want to do that is within the law, and you can always depend on them when you are looking for information; and when you want any backing you have the backing of the whole Agricultural Department.

Some very interesting remarks were made by Mr. Day of the Emery Waterhouse Company, and also by Mr. Greene of the Fairbanks Company, who emphasized the importance of having uniform laws in regard to weights and measures in the different states and of having definite instructions given to the local sealers in sealing and testing scales.

The local sealers from different parts of the state were also called on, and were listened to with much interest, many helpful suggestions being made.

REPORT OF BUREAU OF MARKETING AND SUPPLIES.

To Hon. J. A. Roberts, Commissioner:

I have the honor to transmit herewith the annual report of the Bureau of Marketing and Supplies.

The educational work in which the department has been engaged since January, 1912, resulting in the organization of 60 local unions; the organization of a state central body, known as the Farmers Union of Maine, a wholesale feed and grain business, and the Farmers Union Distributing Company of Boston; the erection of 17 potato houses; the establishing of three grocery stores, and the bringing about of better business methods relative to the conduct of the financial end of farming, took on a new life at the beginning of the year. The farmers suddenly awoke to the fact that there had come among them a force for good that was exceeding their fondest expectations.

As a result of this increased interest the ability of the department was taxed to such an extent that the dates for meetings had to be fixed two or three weeks ahead. Finally, by the direction of the Commissioner of Agriculture, Mr. O. B. Abbott, president of the North Penobscot Produce Exchange, Springfield, Maine, was secured as an assistant. Mr. Abbott rendered valuable aid and as a result the work was carried along rapidly.

In evidence of the great interest manifested by the growers of the state it is interesting to note that since April 1, 1913, no effort has been made to increase the number of unions, neither have the farmers been solicited to join the association. The reason for this can be seen by noting the dates of the unions organized from January 1, 1914, to planting time.

UNIONS ORGANIZED FROM JANUARY 1 TO DECEMBER 31, 1914.

Name of Union.	Date of Organization.
Morning Light Grange Farmers Union Sec., Frank P. Clement, Monroe, R. F. D.	Jan. 5, 1914

Grand Isle Farmers Union
Sec., Alexis Morneault, Grand Isle. Jan. 12, 1914

Skowhegan Farmers Union
Sec., J. Thomas Dionne, Skowhegan. Feb. 5, 1914

Knox Farmers Union
Sec., H. W. Woods, Knox Station. Feb. 17, 1914

Waldo Farmers Union
Sec., Leon R. Hussey, Waldo. Feb. 25, 1914

Maranacook Farmers Union
Sec., F. M. Sawyer, Readfield. Mar. 16, 1914

Soldier Pond Farmers Union
Sec., Thomas Z. Michaud, Soldier Pond. Mar. 20, 1914

Fort Kent Farmers Union
Sec., P. Daigle, Fort Kent, R. F. D. 2. Apr. 1, 1914

Topsfield Farmers Union
Sec., P. T. Pineo, Topsfield. Apr. 10, 1914

Holden Farmers Union
Sec., Harry R. Estes, South Brewer. Apr. 20, 1914

Winterport Farmers Union
Sec., R. F. Cole, Winterport. Apr. 21, 1914

Branch Mills Farmers Union
Sec., E. S. Cain, Palermo. Apr. 25, 1914

South China Farmers Union
Sec., J. A. Jones, South China. Apr. 24, 1914

Olamon Farmers Union
Sec., H. H. White, Cardville. Apr. 29, 1914.

Enfield Farmers Union
Sec., G. W. Fernald, West Enfield. Apr. 30, 1914

Thorndike Farmers Union Sec., Percy Bessey, Freedom.	May 1, 1914
Burnham Farmers Union Sec., O. B. McKechnie, Burnham.	May 14, 1914
Belfast Farmers Union Sec., H. L. Seekins, Belfast, R. F. D. 3.	Aug. 24, 1914
Norridgewock Farmers Union Sec., G. T. Boone, Norridgewock.	Sept. 9, 1914
North Anson Farmers Union Sec., Wilbur Walker, North Anson.	Oct. 7, 1914
Solon Farmers Union Sec., A. C. Heald, Solon.	Oct. 9, 1914
Prospect Farmers Union Sec., Chas. L. Gray, Searsport, R. F. D.	Oct. 10, 1914
Norway Farmers Union Sec., G. W. Richardson, West Paris.	Dec. 5, 1914
Albion Farmers Union Sec., G. M. Hammond, Albion.	Dec. 12, 1914
Lagrange Farmers Union Sec., J. M. Kenney, Lagrange.	Dec. 19, 1914

As the time arrived for the holding of the second annual meeting interest in the outcome increased and the locals all over the state, representing every county in it, became more active. Reports of the financial transactions of each of the locals were forwarded to the manager, and everyone was surprised that the gross transactions had reached such large proportions.

Early on the morning of June 30, the delegates gathered at the rooms of the Bangor Chamber of Commerce, Bangor, Maine. The meeting was called to order by the President, P. E.

Averill, Prentiss, and upon calling the roll it was found that all the officers were present, and 47 of the unions were represented. The Treasurer reported as follows:

Cash on hand	$1,849 16
Accounts outstanding	811 00
Total resources	$2,660 16

The Manager's report covered the work in detail, showing the total transactions of all the unions to be as follows:

Potatoes shipped to the markets	$238,280
Grain purchased by the members	47,150
Fertilizer	52,540
Seed	3,400
Total	$341,370

These figures were far in excess of what we expected. At the start of the shipping season there were but five potato houses belonging to the unions and at no time during the season were there more than 15 of the unions engaged in shipping potatoes. The members of some of these unions are small growers and did not ship over two or three cars. The foregoing figures, however, do not cover the total transactions. Two of the unions that transacted considerable business failed to report, and in addition the members purchased articles through other sources, made possible by the Farmers Union of Maine, that would bring the grand total to over $400,000.00.

To Maine's 40,000 owners of farms the Farmers Union comes as a deliverance from many unfortunate conditions. It has demonstrated to them that their attention must be directed to the business end of farming as well as the scientific growing of the crops; that every grade of the product has a market value; that each grade must be shipped true to its kind; that collective buying is a great factor along the line of saving; and furthermore, it has demonstrated to the farmer that individually he is of little importance in the business world, but collectively he is a power.

COMMERCIAL FERTILIZER.

That the Bureau of Marketing and Supplies has assisted the farmers in securing their supply of commercial fertilizers has brought out adverse criticism on the part of some of the manufacturers. This criticism we believe to be uncalled for. If the bureau succeeds in bringing about correct business methods in the purchasing of commercial fertilizer, the manufacturers will profit largely by the change. Under the present methods of December payment the companies lose many bills, and besides, collections are costly in the extreme. If the efforts of the department succeed in bringing about a banking system that will enable the farmers to borrow the cash at a reasonable rate of interest, thereby banishing forever the unfortunate December payment method, the manufacturers will profit to as great an extent as the farmers. The farmers' organization would consider it a misfortune if they were obliged to handle all the fertilizer used in the state.

The system under which commercial fertilizer has been handled ever since it was used in the state has been wasteful in the extreme. It might be compared with the system of handling milk, groceries and provisions. Dozens of milk wagons, grocery teams, etc., drive all over the city, each furnishing scattered customers and adding to the expense of distribution. In a like manner there are numerous fertilizer manufacturers, each maintaining a general state agency, and this agency appoints an army of sub-agents in every producing center. In this way there may be numerous manufacturers represented in a section where the total tonnage does not amount to over a thousand tons. In addition to this there are traveling agents scouring the country, paying railroad fares, hotel bills, carriage hire, etc., all adding to the cost which the farmer has to pay. It may be said that these men are entitled to a living, and this we will not dispute, but we owe something to our producers and every possible expense should be eliminated.

MAINE AN AGRICULTURAL STATE.

Maine is an agricultural state and the prosperity of the cities and towns depends entirely upon the prosperity of the producer, and if we would make Maine better and greater we must give more attention to it agriculturally. One of our daily papers in an editorial took exception to the farmers engaging in business, and practically advised them to go back to the farm and raise more and better crops and market these crops through the city man. The editor had in mind only the old methods of our fathers and our grandfathers and forgot that all lines of trade had progressed and the man who followed the old methods would meet with misfortune.

THE POTASH SITUATION.

It is a well known fact that Germany is practically our only source of supply along potash lines. Before war was declared in Europe about one-third of the American contracts had been delivered. In addition there was quite a large tonnage left over from the season of 1913, making the total tonnage nearly half the normal supply. The various manufacturers met at Philadelphia and agreed upon the percentage of potash they would furnish the farmers. Maine was allowed a 4 per cent mixture, while other sections were given a 3 per cent and still others a 2 per cent.

The usual analyses sold in Maine are a 4-8-7, 4-6-10, 4-8-10 and 5-8-7. These analyses were changed to a 4-8-4 and a 5-8-4. It will be understood that whatever potash was delivered before the war started cost the manufacturers the usual price. However, the scarcity of the article in question naturally increased the market value of the potash, and prices advanced rapidly, reaching $100 per ton in a short time. The prices charged were based upon the market value and therefore the farmers were called upon to pay very high for their fertilizer. In 1913 the companies sold a 5-8-7 at $33.00 cash. In 1914 they sold a 5-8-4 at $36.00 cash. While the actual value of a 5-8-4 is $6.00 less than a 5-8-7, the farmers were called upon to pay $3.00 more for a 5-8-4 this season than they paid for a 5-8-7 last season, making the value of a 5-8-7 this season $42.00.

In accordance with the value of the plant food contained in the mixtures the farmers had to pay an advanced price of $6.00 per ton, and figuring from the total estimated tonnage used in the state, amounting to 200,000 tons, then the unfortunate potash situation cost the farmers of Maine about $1,000,000.00.

This, added to the low price of potatoes up to this time, with no hope for an advance this season, does not make the outlook for the farmers highly encouraging.

The planting of a 4 per cent potash in the place of a 7 per cent was what confronted the growers and they looked about them for a way out of the dilemma. The membership of the Farmers Union of Maine appealed to the Bureau of Marketing and Supplies, requesting that every effort be made to supply them with the usual analysis. The outlook was not at all encouraging, but after a thorough search through the chemical centers the Farmers Union of Maine was placed in a way to secure a 4-8-7, 5-8-7, 4-8-4, 5-8-4 and 4-6-10 at the following prices delivered at destination:

4-8-4	$30.50
5-8-4	33.00
4-8-7	36.50
5-8-7	39.00
4-6-10	41.50

Last season the Farmers Union furnished a 5-8-7 at $33.00 and a 4-6-10 at $31.50, making the actual value of a 4-6-10 $1.50 less than a 5-8-7. This season the cost of a 4-6-10 is $3.50 more than a 5-8-7, owing to the fact that the 4-6-10 contains potash to the cost of $21.00 while the 5-8-7 contains only $14.00 worth of potash.

The farmers have many problems to solve along fertilizer lines and the more quickly our moneyed men and legislators arrive at this conclusion the more quickly will Maine prosper.

The Farmers Union must have fertilizer mixing plants and the farmers must practice home mixing and when this is brought about a radical change will have been perfected along the reduction of the cost of producing. The erection of buildings and the purchasing of the necessary equipment will be but a small portion of the money required. The chemicals necessary will all come with draft attached and these drafts must be taken up before the cars are unloaded. The funds necessary to purchase all these ingredients must be raised in Maine, and if the State Board of Trade are in earnest in their desire to be of benefit to all Maine, they will see that the farmers are placed in possession of sufficient funds to finance all operations along fertilizer lines.

PLANS PERFECTED.

The report of the bureau for 1913 made mention of certain plans for the future. Among them was the bringing together of all the unions in certain sections under the head of one manager. This movement was started along that part of the Maine Central Railroad from Bangor to Vanceboro, including the unions at Olamon, Lincoln, Lincoln Center, North Lincoln, Winn, Kingman, Wytopitlock, Danforth, Forest and Mattawamkeag. It is too early to be able to submit a report in detail of the operations of the plan, but from information at hand we believe it will be the policy to follow in all parts of the state.

Another innovation was the organizing of a distribution house in Boston and New York. The plan has been carried out in Boston, and we now have the Farmers Union Distributing Company, located at 20 Boston and Maine Produce House, Charlestown, Mass. While the farmers are directly represented in New York, a regular distributing house owned and controlled by the farmers is not yet an accomplished fact; but it will be in the near future.

POTATO HOUSES.

In building or purchasing potato or shipping houses the unions have made most excellent progress. Houses have been erected on the Aroostook Valley Railroad at New Sweden, on the Bangor and Aroostook Railroad at New Sweden, Stockholm, Easton and Ashland, and on the Maine Central Railroad at Forest, Danforth, Wytopitlock, Kingman, Winn, North Lincoln, Lincoln, Lincoln Center, Winterport, Palermo, South China, Knox, Skowhegan and Hinckley. In addition, the Central Maine Produce Exchange of Waterville purchased one of the buildings of the Austin and Haines Company and is now engaged in the retail grain, feed and grocery business, and also handles farm machinery. The Thorndike Farmers Union has rented a house and is also in the feed and grain business. The Waldo County Farmers Union has bought the store of Farwell Brothers and is also engaged in the feed business. The Cumberland and Oxford Exchange has erected a feed house and installed machinery for grinding purposes. The union at Madison is also engaged in the feed business, and others are fast making arrangements to enter business in the feed line.

Outside of the potato business the various lines in which the unions are engaged are meeting with success. The potato situation is unusually bad from a grower's standpoint, and unfortunately there is no relief in sight. Prices are ruling lower, and freight rates grow higher as the price declines.

When some important question is to be considered, it is the general practice to appoint a commission or create a department, and then proceed to investigate the existing conditions, having in view the adoption of such reforms as a series of experiments shall suggest. This is a slow method and the farmers object to being the object of long drawn out experimentations.

In the case of the Bureau of Marketing and Supplies this method fortunately was not necessary. The plan of the Farmers Union of Maine was perfected in every detail long before its workings were tested in Maine, and all parts of the plan except the state-wide basis had been in practical operation in other states for a number of years and had been found correct in the light of our present knowledge. The union is not in business to pull down, but to build. The farmer does not desire to drive the shipper, the fertilizer manufacturer, the grain dealer, or any other business out of the state. He simply asks the same rights and privileges that others enjoy. We have the grain dealer located in every town. If another dealer locates in the same town it would hardly be noted. Therefore, what difference does it make if this dealer is an independent factor or a farmers' union? Our potato buyers are located in every producing center and their numbers are from time to time being increased, and the farmer simply requests that he be allowed to erect a potato house and work side by side with the independent buyer.

We have an army of fertilizer agents covering every section of the state, each adding to the cost of the goods, and the farmer in order to save this expense has concluded to buy his goods direct from the factory and this decision on his part will certainly meet with the approval of all right thinking men.

FARM METHODS.

In order to attract attention to needed legislation, it is sometimes necessary to expose existing conditions. We boast of the prosperity of our Maine farmer. While this is true of a small percentage, this prosperity on the whole is on the surface,—a thin veneer which one poor crop will puncture. There are many farmers who owe two years' fertilizer and grocery bills, and many of them are obliged to pledge their crop before it is planted in order to secure fertilizer with which to grow it. It is estimated that 200,000 tons of fertilizer are used in the state, and that over 150,000 tons are purchased by the farmer on time, at a rate of interest in the past amounting to from 25 to 40 per cent. One hundred and fifty thousand tons at $38.00 per ton amounts to $5,700,000. If the farmer could purchase these 150,000 tons of goods on a cash basis they would cost him only $4,800,000, a saving of $900,000. If the farmer saves $900,000 then the state is that much better off financially. The farmer pays $38.50 per ton for a 4-6-10 when he buys on December payment, while if he purchases for cash through his association he pays $32.50, a difference of $6.00, or 36 per cent. Farm machinery, harnesses, sleighs, etc., are bought on the same basis, all combining to keep the farmer poor.

RURAL CREDIT BANKS.

There are many land credit schemes in Europe, but not many of them would work out successfully in this country. However, we are fast drifting into European conditions. That the European land problem should have arisen in this country while those who are still living have seen land free for the asking and approved of granting millions of acres of the public domain in the form of subsidies to railways, shows how rapidly the world fills up and how precious the land is. Many are now demanding that the government shall lend the people money to buy back the land it gave away to the railways.

Many senators and representatives have interested themselves in various plans for rural credit. Among these plans was the Moss-Fletcher bill, but this did not appear to be just what the farmers required. Then it was decided that direct government aid was both politically expedient and desirable, and then appeared the Federal Farm-Loan act, called the Bulkley bill, with the following provisions:

That any five persons may form a coöperative farm-loan association like a mutual building-loan association, for the purpose of lending money to its stockholders up to fifty per cent of the value of the land's improvements, on first mortgages maturing in five to thirty years;

That each farm-loan association shall contribute at least $1,000 to the capital stock of a Federal Land Bank;

That there shall be twelve Federal Land Banks of $500,000 capital each to supervise the farm-loan association, and that the Federal Land Banks in turn shall be supervised by the Federal Reserve Board at Washington;

That these Federal Land Banks shall issue farm-land bonds, engraved by the United States Government and secured by the mortgages assigned to them by, and purchased by them from, the farm-loan association;

That in the event of the $500,000 capital stock of each of the twelve Federal Reserve Banks failing to be otherwise subscribed, the United States Government shall provide it; and

That the Secretary of the Treasury shall, upon application of one or more of the Federal Land Banks, and upon the recommendation of the Federal Reserve Board, purchase from the Federal Land Banks farm-loan bonds not previously issued or sold, in an amount not to exceed $50,000,000 during any one year, and shall pay for the same out of any money in the treasury not otherwise appropriated.

It was thought that this bill would pass Congress at the last session, but owing to other measures considered more important from a political standpoint it was crowded to one side, and there is no hope that it will even be considered at the present session.

With a few changes the Bulkley bill, or the Federal Farm-Loan act, would appear to be just what is required as a rural credit system and our farmers will watch with much interest the course pursued by our representatives in both the House and the Senate.

The Farmers Union of Maine is fast solving some of the most difficult problems of the farm, but from whatever angle we work the one great obstacle that stands out clear and distinct is the lack of funds with which to properly finance our operations. Our state officers, representatives and business men are greatly interested in the welfare of the state and direct their efforts along many lines, without turning their attention to that great source of wealth, the farm. They practically say to the farmer,—"Here is the land; what more do you want?" ignoring the plain truth that no business undertaking can reach its highest development without capital. They have exempted manufacturers from taxation for a period of years, they have erected buildings and given them rent free that new industries might be established, and they have granted unlimited credit that the number of factory chimneys might be increased. The bankers say that no security the farmer can offer is a liquid asset; his mortgage is not capable of ready conversion into cash and is not marketable paper. Thus the farmer is deprived of the cheap money enjoyed by the manufacturer and the other producer, although there can be no better security than productive land which is increasing in value. A series of long term mortgage banks would solve the financial problem and bring prosperity to all Maine, and it would appear that our financial institutions and our men of wealth have been and are pursuing a short-sighted policy not to have recognized long ere this that prosperity begins at the farm and that the successful operations of the farm require capital, as well as those of any other business enterprise.

I would earnestly urge that the Agricultural Department immediately take steps to establish some system of farm credit that will relieve the farmer from the exorbitant interest he now pays because of buying on time, and retain in the state Maine's money for Maine.

Respectfully submitted,

C. E. Embree.

FARMERS UNION OF MAINE.

OFFICERS.

President, C. H. Gardner, Skowhegan
Vice-Pres., Edward Evans, Belfast, R. F. D.
Treasurer, W. S. Rogers, Cathance
Clerk, Chas. C. Clement, Winterport
Gen. Manager, C. E. Embree, Bangor

DIRECTORS AT LARGE.

J. A. Roberts, J. P. Buckley

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August Peterson, New Sweden, New Sweden Grange Produce Company
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O. B. Abbott, Springfield, North Penobscot Produce Exchange
B. F. Cleaves, Easton, Easton Farmers Union
W. L. Coburn, Ashland, Ashland Maine Farmers Union
Wilbur Reynolds, Burnham, Waldo County Farmers Union
A. W. Johnson, Jemtland, Farmers Union of Stockholm

C. A. Nason, Hampden Highl'ds, Hampden Produce Exchange
F. D. Erskine, Windsorville, Windsor Farmers Union
A. C. Swazey, Bucksport, Bucksport Farmers Union
J. H. McKinley, Brooks, Brooks Farmers Union
A. W. King, So. Brewer, R. F. D., Orrington Farmers Union
L. A. Burns, Clinton, Clinton Farmers Union
L. C. Libby, Lincoln, Lincoln Farmers Union
Hugh F. Goodwin, St. Albans, Somerset County Farmers Union
W. M. Loomis, Harmony, Harmony Farmers Union
Alex. Mills, Belgrade, Belgrade Farmers Union
Albert Pratt, Wilton, Franklin County Farmers Union
A. O. Pike, Fryeburg, Fryeburg Farmers Union
Alonzo Butler, Union, North Knox Potato and Apple Growers' Ass'n
E. E. Towne, Madison, Kennebec Valley Farmers Exchange
George W. Worster, Bangor, R. F. D., Kenduskeag Valley Farmers Union
Chas. C. Clements, Winterport, Morning Light Grange
P. A. Cyr, Grand Isle, Grand Isle Farmers Union
C. H. Gardner, Skowhegan, Skowhegan Farmers Union
H. A. Shibles, Knox, Knox Farmers Union
A. S. Nickerson, Readfield, Maranacook Farmers Union
T. Z. Michaud, Soldier Pond, Soldier Pond Farmers Union
John Q. Mason, North Lovell, Oxford County Farmers Union
W. J. Audibert, Ft. Kent, Fort Kent Farmers Union
Claude D. Scribner, Topsfield, Topsfield Farmers Union
Arthur B. Davis, Holden, Holden Farmers Union
Fred A. Lowe, Winterport, Winterport Farmers Union
R. H. Reed, Weeks Mills, Branch Mills Farmers Union
I. L. Jones, South China, South China Farmers Union
W. W. Kelley, Olamon, Olamon Farmers Union
A. W. Bradbury, Burlington, Enfield Farmers Union
R. W. Betts, Thorndike, Thorndike Farmers Union
H. E. Kinney, Burnham, Burnham Farmers Union

LIST OF THE FARMERS' UNIONS IN MAINE.

DECEMBER 31, 1914.

New Sweden Grange Produce Co., New Sweden
Pres., August Peterson, New Sweden
Sec., Andrew H. Nelson, New Sweden

Androscoggin Grange Coöperative Ass'n, Auburn
Pres., W. E. Leland, Auburn, 108 Main St.
Sec., V. W. Canham, Sanford, 38 Wash. St.

Aroostook Potato Growers' Ass'n, Presque Isle
Pres., L. E. Tuttle, Presque Isle
Sec., J. Frank Guiou, Presque Isle
Mgr., Guy C. Porter, Houlton

Central Maine Coöperative Ass'n, Dover
Pres. E. W. Livermore, Sebec
Sec., B. L. Batchelor, Dover

Maine Central Potato Exchange, Brunswick
Pres., T. W. Skelton, Bowdoinham
Sec., W. S. Rogers, Cathance

Maine Central Potato Exchange, Dexter
Pres., F. L. Hutchinson, North Dexter
Sec., F. L. Hutchinson, North Dexter

Central Maine Produce Exchange, Pittsfield
Pres. P. J. Whitten, Pittsfield
Sec., A. B. Crawford, Pittsfield

Central Maine Farmers Exchange, Waterville
Pres., W. C. Stetson, Waterville, R. F. D. 37
Sec., J. O. Peck, Waterville, R. F. D. 39

Aroostook Farmers Exchange, Ft. Fairfield
Pres., George F. Ashby, Ft. Fairfield
Sec., Stephen E. Ames, Ft. Fairfield, R. F. D.

Cumberland & Oxford Produce Exchange, Bridgton
Pres., B. W. Gibbs, Bridgton
Sec., J. A. Chadbourne, Bridgton

Maine Central Produce Exchange, Farmington
Pres., George H. Thomas, Farmington Falls
Sec., J. H. Merrill, Farmington Falls

North Penobscot Produce Exchange, Springfield
Pres., O. B. Abbott, Springfield
Sec., P. E. Averill, Prentiss

Eastern Maine Produce Exchange, Danforth
Sec., Lewis Huff, Danforth

Easton Farmers Union, Easton
Pres., B. F. Cleaves, Easton
Sec., Dura Stanchfield, Easton

Ashland Maine Farmers Union, Ashland
Pres., C. C. Peterson, Ashland
Sec., L. E. Young, Ashland

Waldo County Farmers Union, Unity
Pres., W. E. Reynolds, Burnham
Sec., W. L. Gray, Troy

Farmers Union of Stockholm, Stockholm
Pres., A. W. Johnson, Stockholm
Sec., J. E. Berquist, Stockholm

Hampden Produce Exchange, Hampden
Pres., Chas. A. Nason, Hampden Highlands
Sec., C. E. Carter, Bangor, R. F. D. 2

Windsor Farmers Union, Windsor
Pres., F. D. Erskine, Windsorville

Farmers Union Grain & Supply Co., Waterville
Pres., E. E. Austin, Waterville
Sec., John E. Nelson, Augusta

Bucksport Farmers Union, Bucksport
Pres., A. C. Swazey, Bucksport
Sec., R. S. Genn, Bucksport

Brooks Farmers Union, Brooks
Pres., Wm. O. Deering, Brooks
Sec., Robt. M. Stiles, Brooks

Orrington Farmers Union, Orrington
Pres., A. W. King, So. Brewer, R. F. D.
Sec., Raymond L. Perkins, So. Brewer, R. F. D.

Clinton Farmers Union, Clinton
Pres., Willis E. Knight, Clinton
Sec., L. A. Burns, Clinton

Lincoln Farmers Union, Lincoln
Pres., J. C. Parsons, Lincoln
Sec., Ard Edwards, Lincoln

Somerset County Farmers Union, St. Albans
Pres., P. W. Libby, St. Albans
Sec., H. F. Goodwin, St. Albans

Harmony Farmers Union, Harmony
Pres., W. M. Loomis, Harmony
Sec., Wm. G. Bailey, Harmony

Belgrade Farmers Union, Belgrade
Pres., Alex. Mills, Belgrade
Sec., John W. Penney, Belgrade

Franklin County Farmers Union, Franklin
Pres., Albert Pratt, Wilton
Sec., Wilber W. Wilkins, Wilton

Fryeburg Farmers Union, Fryeburg
Pres., A. O. Pike, Fryeburg
Sec., L. D. Charles, Fryeburg

North Knox Potato & Apple Growers' Ass'n, Union
Pres., W. A. Ayer, Union
Sec., H. L. Grinnell, Union

Kennebec Valley Farmers Exchange, Madison
Pres., E. E. Towne, Madison
Sec., A. H. McKenney, Madison

Kenduskeag Valley Farmers Union
Pres., George W. Worster, Bangor, R. F. D.
Sec., Eben E. Fogg, Bangor, R. F. D.

Morning Light Grange, Monroe
Sec., Frank P. Clement, Monroe, R. F. D. 3

Grand Isle Farmers Union, Grand Isle
Pres., P. A. Cyr, Lille
Sec., Alex. Morneault, Grand Isle

Skowhegan Farmers Union, Skowhegan
Pres., C. H. Gardner, Skowhegan
Sec., J. T. Dionne, Skowhegan

Waldo Farmers Union, Waldo
Pres., Edward Evans, Waldo
Sec., Leon R. Hussey, Waldo

Knox Farmers Union, Knox
Pres., Joseph E. Wing, Thorndike, R. F. D. 1
Sec., H. W. Woods, Brooks, R. F. D.

Maranacook Farmers Union, Readfield
Pres., A. S. Nickerson, Readfield
Sec., F. M. Sawyer, Readfield

Soldier Pond Farmers Union, Soldier Pond
Pres., Albert Daigle, Soldier Pond
Sec., Thomas Z. Michaud, Soldier Pond

Oxford County Farmers Union, North Lovell
Pres., John Q. Mason, No. Lovell
Sec., A. B. Garcelon, No. Lovell

Ft. Kent Farmers Union, Ft. Kent
Pres., W. J. Audibert, Ft. Kent.
Sec., P. Daigle, Ft. Kent

Topsfield Farmers Union, Topsfield
Pres., H. Kneeland, Topsfield
Sec., P. T. Pineo, Topsfield

Holden Farmers Union, Holden
Pres., W. L. Hart, Brewer, R. F. D. 5
Sec., Harry R. Estes, Brewer, R. F. D. 5

Winterport Farmers Union, Winterport
Pres., Fred A. Lowe, Winterport
Sec., R. F. Cole, Winterport

Branch Mills Farmers Union, Palermo
Pres., R. H. Reed, Weeks Mills
Sec., E. S. Cain, Palermo

South China Farmers Union, South China
Pres., I. L. Jones, South China
Sec., J. A. Jones, South China

Olamon Farmers Union, Olamon
Pres., T. Heseltine, Olamon
Sec., H. H. White, Cardville

Enfield Farmers Union, Enfield
Pres., A. W. Bradbury, Burlington
Sec., G. W. Fernald, West Enfield, R. F. D.

Thorndike Farmers Union, Thorndike
Pres., Robt. W. Betts, Thorndike
Sec., Percy Bessey, Freedom

Burnham Farmers Union, Burnham
Pres., H. E. Kinney, Burnham
Sec., O. B. McKechnie, Burnham

Belfast Farmers Union, Belfast
Pres., M. O. Wilson, Belfast, R. F. D. 3
Sec., H. L. Seekins, Belfast, R. F. D. 3

Norridgewock Farmers Union, Norridgewock
Pres., H. L. Heald, Skowhegan, R. F. D.
Sec., G. T. Boone, Norridgewock

North Anson Farmers Union, North Anson
Pres., A. W. Reed, North Anson
Sec., I. H. Ellis, North Anson

Solon Farmers Union, Solon
Pres., Arthur Z. Rowell, Skowhegan, R. F. D. 4.
Sec., A. C. Heald, Skowhegan, R. F. D. 4

Prospect Farmers Union, Prospect
Pres., Jasper A. Gray, Stockton Springs
Sec., Charles H. Gray, Searsport

Norway Farmers Union, Norway
Pres., F. P. Towne, Norway
Sec., G. W. Richardson, West Paris

Albion Farmers Union, Albion
Pres., Llewellyn G. Robinson, Albion
Sec., Geo. M. Hammond, Albion

Lagrange Farmers Union, Lagrange
Pres., Willard Snell, Lagrange
Sec., John M. Kenney, Lagrange

REPORT OF THE CHIEF OF THE BUREAU OF INSPECTION.

To the Hon. J. A. Roberts, Commissioner of Agriculture:

I have the honor to submit to you my report of the inspection work accomplished by this bureau during the year 1914.

The various commodities—the sale of which the Bureau of Inspections has attempted to regulate—include agricultural seeds, commercial feeding stuffs, commercial fertilizers, fungicides, insecticides, drugs and foods; in the latter part of the year, owing to the resignation of the Milk Inspector, the work of milk inspection was placed under its supervision and since September third, when the Net Weight law became effective, the enforcement of this statute has also been the duty of this branch of the department.

Since the organization of the new Bureau of Inspections on January first, 1914, the same general methods of inspection have been adopted as employed by the former chief executive—the director of the Agricultural Experiment Station, Orono, Maine,—and practically no changes have been made in the force of inspectors except that it has been increased as the volume of inspection work has demanded. All samples collected by inspectors, and all samples received from dealers and correspondents, have been forwarded promptly to the Agricultural Experiment Station, as the statute provides that all analytical work authorized by the Commissioner of Agriculture shall be performed there. Three hundred and ninety-six towns and cities of the state have been visited at least once, and many of them several times, in carrying on the inspection and educational work and the collection of food and drug samples, and a complete inspection has at all times been maintained in the three largest cities of the state.

As required by chapter 119, P. L. 1911, an annual registration is necessary to legalize the sale of each brand of feeding stuff, fertilizer, fungicide and insecticide in the State of Maine;

a manufacturer's certificate, accompanied by the proper registration fee, is filed at this office for every brand, and the issuing of registration certificates, together with the book-keeping and vast amount of correspondence in connection with registration matters, has devolved upon this bureau.

The early winter months were devoted to the inspection of feeding stuffs, as during that season of the year the consumption of these products is larger than at any other time; the fertilizer inspection followed during the months of early spring. The inspection of seeds was, of course, confined to the spring months and the work was performed with great care by an expert seed analyst who himself made a tour of inspection. In the late spring and early summer the inspection of fungicides and insecticides was taken up, this time of year seeming to be the logical season for the regulation of the sale of spraying materials, etc.

The inspection of foods and drugs has been carried on continuously throughout the year and samples have been collected. As stated above, all samples have been forwarded to the Experiment Station for analysis. As the statute also provides that the results of all analyses shall be published by the director of the Agricultural Experiment Station, it is unnecessary to do more in this report than refer to the number of the Official Inspections containing detailed tabulations of the results of the examinations of the class of samples collected, together with such discussion as is deemed necessary. Copies of the Official Inspections are always obtainable from the Experiment Station upon application.

Seed Inspection.

The seed inspection for the year 1914, in accordance with the usual custom, was conducted by a seed analyst from the Experiment Station, and it seems that some mention should be made of our special good fortune in being able to obtain the services of a man so well qualified for this work and who—through his experience—is usually able to tell by observation whether a seed conforms to its brand of purity. During the past year the seed analyst visited one hundred and thirty-seven principal cities and towns of Maine, calling on three hundred and twenty-eight dealers, and examining twelve hundred and fifty-two samples of seeds. It is very gratifying to report that only eight samples warranted minute examination and these were eventually passed.

The results of the analyses of the samples, together with the names of the dealers, may be found in Official Inspections No. 64.

Feeding Stuffs Inspection.

The work of inspecting feeding stuffs was carried on during the winter months, and registrations have occupied more or less of our time throughout the year. The total number of feeding stuffs registered during the year 1914 was four hundred and fifty-one. These brands included a great variety of feeds—cottonseed meals, cottonseed feeds, gluten meals, linseed meals, dried distillers' grains; wheat offals, feed flours; wheat offals, middlings; wheat offals, bran; wheat offals, mixed feed; also, numerous miscellaneous compounded feeds and a long list of poultry feeds.

In the enforcement of the law, it is the duty of the inspectors of the department to visit the principal places in the state where feeding stuffs are offered for sale, examine the stock, find out if the goods the dealers are selling are protected by registration and take samples for analysis. When, upon examination, the amount of the protein, fat and fiber content is determined, the results are compared with the manufacturer's certificate and the label on the package of the brand in question, in order to discover whether or not the consumers are receiving the quality of goods guaranteed to them. Even by this system of careful inspection, it is impossible to secure a complete index of the quality of feeding stuffs offered to the consumers of the state without the closest coöperation on the part of the feed dealers, and when shipments of grain—cottonseed meal in particular—are received by the grain dealers, these dealers are advised and urged to draw samples and forward them to the Station for analysis in order that the quality of the goods may be determined and the dealers may act in conformity with the law in dispensing them. Where brands have been reported "Not up to guaranty," or not protected by registration, a hearing has been arranged with the dealer exposing the goods and an explanation asked for; in all, seventy hearings have been arranged.

In general the relations between the Bureau of Inspections and the feeding stuffs dealers have been pleasant, and a feeling of fairness and coöperation has been clearly demonstrated by the feeding stuffs manufacturers who are shipping their products into this state.

Two hundred and two official feeding stuffs samples were drawn by the inspectors during the year and the results of the analyses—together with the analyses of those samples submitted by dealers—may be found in Official Inspections No. 60.

Fertilizer Inspection.

The work of the bureau in this connection is, in many ways, quite similar to that of the feeding stuffs inspection; it requires the enforcement of the law providing for the registration of all brands of fertilizers offered for sale in Maine, and the filing of manufacturer's certificates at this office before sales can be legalized. As stated above, the work of fertilizer inspection was carried on in the early spring months and was accomplished by inspectors instructed to draw samples fairly representing the goods as sold in the open market; in any instance where the lot was of sufficient amount, such samples were taken from ten bags and thoroughly mixed.

On the whole, the fertilizer manufacturers and agents have shown a willingness to comply with the law and to protect the dealers handling their products in this state by the necessary registration; their attitude, in nearly all cases, has been very fair and businesslike.

The total number of samples collected and analyzed was five hundred and sixty-six; of this number, eighteen brands were not protected by registration and hearings were arranged with the dealers with whom the goods were found. Upon investigation, it was in most cases proven that the goods had been shipped direct from the manufacturer to the consumer and used for experimental purposes; such goods—in accordance with the interpretation of the law—require no registration. In other instances it was found that the goods were unregistered merely through an oversight on the part of the manufacturers, evidently entirely unintentional.

When, upon analysis, goods were found untrue to guaranty—which happened in only a very few cases—a report of the analysis was sent to the parties responsible, a hearing arranged, and the parties not excused until a satisfactory explanation regarding the deficiency was given.

During the past season it was brought to the attention of the department that the New Mineral Fertilizer Company, who have a plant at Rumford, Maine, had been selling goods evidently contrary to the law, no registration having been issued to them from this office. In order to ascertain the volume of business and the amount of the product shipped from Rumford station from January first, 1914, to May ninth, 1914, the matter was carefully taken up by one of the inspectors and the result of his investigation showed that two hundred and twenty-four tons had been shipped out of the state and fifty-two tons shipped to different points within the state. It was also ascertained from the different people to whom these goods had been shipped that actual sales had taken place; possessed of this evidence, a hearing was arranged with the New Mineral Fertilizer Company and a request made for an explanation as to why registration had not been arranged. Samples of the goods were obtained through several sources and analyses made and the parties to whom the goods had been shipped, the director of the Experiment Station and the writer, appeared before the Grand Jury in Portland at the September term of court. A true bill was found by the Grand Jury but, owing to the congestion of business at that time, the case was continued. After all that has been written warning people concerning the worthlessness of this product for fertilizing purposes, it seems almost incredible that this company were able to dispense two hundred and seventy-five tons.

In the late summer and during the remainder of the year, numerous inquiries were received from the fertilizer companies as to what the attitude of the department would be towards those companies selling goods containing less potash than in former seasons; also, numerous letters containing information that the potash content in most of the fertilizers to be registered would necessarily be less, were addressed to this bureau. It may be well to state that we have replied to all such inquiries to the effect that there will be no interference with any brand when the guaranty on the certificate and on the package as to the amount of potash agree with that found in the analysis. There is nothing in the law that prevents the sale of a fertilizer that contains no potash, and realizing the dearth of potash and the hardship to the manufacturers, it will be the policy of this department to assist and coöperate with the manufacturers in every way possible, keeping always within the limits of the law, however.

The results of the analyses of samples of fertilizers have been published in Official Inspections No. 62.

Fungicides and Insecticides Inspection.

The inspection and registration of fungicides and insecticides have occasioned considerable labor, especially in the way of correspondence, due to the fact that the law in the State of Maine is somewhat different from the law regulating the sale of these commodities in other states. As this law is of comparatively recent enactment, we have found it is not thoroughly understood by many offering these products for sale just what constitutes an insecticide under the definition of the statute, which seems to cover a wider range than was probably originally intended; however, according to the definition under the statute, insecticides include Paris green, lead arsenate and "any substance or mixture of substances intended to be used for preventing, destroying, repelling or mitigating any insect which may infest vegetation, man or other animals, or houses, or be present in any environment whatsoever."

The work of inspection has been carried on carefully and one hundred and seven samples have been collected for analysis, including arsenate of lead, arsenate of zinc, Paris green, lime-sulphur solution, lice killers, moth repellants, larkspur lotions, "Rat-Bis-Kit" Paste (carrying insecticidal claims), Cooper's Sheep Dipping Powders, and other numerous preparations. The results of the analyses as noted in the tabulations have shown no serious discrepancy between preparation in question and the guaranty in the manufacturer's certificate or on the package, and no hearings on this charge have been arranged.

The total number of brands registered for sale in Maine during the year 1914 was two hundred and nineteen. The Inspectors found a large number of insecticides offered for sale without registration, however, and one hundred and twenty-eight hearings were arranged as a result of these violations. In most cases, when the facts were obtained, it developed that the goods had been purchased prior to the year 1914 and had been registered when bought but had been carried over to the following year without re-registration; sometimes it was proven to be an oversight on the part of the manufacturers, and in still other cases where notices were sent to the manufacturers that their goods must be registered in order to legalize the sale, the products were withdrawn and their sale in the State of Maine discontinued; the latter conditions, however, are not true of insecticides or fungicides sold in large quantities like Paris green or arsenate of lead. In the case of certain remedies not expressly designed as insecticides but carrying rather elaborate statements in the way of insecticidal claims, the manufacturers have released such products from registration requirements by changing the phraseology of their labels and eliminating such claims from their advertising matter, when the existing law has been brought to their attention.

Perhaps it may be well at this time to call the attention of the consumer to the fact that the necessity for an insecticide law is apparent owing to the increased sale and consumption of these products in recent years due to the advent of two dangerous and destructive insects, namely, the gypsy and the brown tail moths; in combating these pests, the employment of correct spraying materials is very effective.

The results of the analyses of fungicide and insecticide samples may be found in Official Inspections No. 68.

Drugs Inspection.

The work of drug inspection is not in any way indicated by the actual collection of samples. The inspectors have been constantly on the alert, examining labels for examples of misbranding, and using consistently the tabulated form of report for drug stores which communicates rather complete information as to the methods employed in conducting this line of business. In answering the questions required on this report, the general conditions of the store in question are noted; the cleanliness of the prescription counter; the number of registered clerks employed, etc. Information is also given as to the marking of shelf and stock bottles with the alcohol content, as required by law, and, if soda fountains are operated, a special report is made regarding the sanitation, cleanliness of glasses and other utensils, and the source of the sirups used, and if preservatives or artificial coloring are employed, a report of the announcement of this fact.

When technical violations have been reported by the inspectors, the matter has been taken up in an educational way and a letter of warning relative to the general unsanitary conditions, improper marking of bottles, or the absence of a card announcing the use of preservatives and artificial coloring, etc., has been sent to the offender. Numerous letters have also been written calling the attention of dealers to the fact that care should be taken in dispensing Spirit of Nitrous Ether, informing them of the danger in selling this preparation that deteriorates so rapidly with age, advising them that only a small quantity should be made at a time and that bottles purchased from wholesalers should bear a limiting date. Inspectors have been instructed to discourage, as far as possible, the sale of Sweet Spirit of Nitre in city grocery stores and to recommend that the sale of this preparation be undertaken by druggists only. It would doubtless work considerable hardship to have the sale discontinued in the country grocery stores, as this is a substance for which there is considerable demand, but an attempt has been made to regulate such sale and, as stated above, the sale in city grocery stores has been advised against and the trade given to drug stores, where proper care should be taken in dispensing this product.

Aside from the general inspections as an educational feature during the year, drug samples were collected and analyzed, care having been taken to make the sampling and collections as complete as possible in the towns visited. For the most part, the articles collected were of the druggists' own manufacture, while in a few instances it developed that the samples were purchased from wholesalers. In a few cases the samples were collected as the result of complaints, but these conditions were not general. Tincture of Iodine, Spirit of Gaultheria, Spirit of Peppermint, Spirit of Nitrous Ether, Extract of Hamamelis, Spirit of Camphor, etc., were among the preparations collected; also miscellaneous articles—not taken generally—such as Sweet Oil, Witch Hazel Cream and the Vurpillat Remedies, a collection of drugs sold by a travelling fakir, were taken for analysis. The last named articles were taken as the result of a complaint and, while the examination did not show any deleterious substance, the analysis proved that these "Remedies" if used would show but slight therapeutic value. It will be seen that in general the articles collected consisted of simple compounds, and it is hoped that we were not judged unreasonable in obtaining products not difficult to manufacture in conformity with the United States Pharmacopoeia standard While serious deficiencies were found in some of the samples, after careful investigation it seemed apparent that scarcely any wilful or intentional violation of the law had been discovered. Seeming, as it does, of utmost importance that a drug—whether recognized by the United States Pharmacopoeia or not—should possess the proper therapeutic qualities and, when administered, produce the desired physical effect, as our duty has been interpreted to remedy the conditions found and give impartial enforcement of the law that was found necessary to place on our statute books, when violations were detected hearings were arranged and a careful investigation made in each case.

For the most part, the druggists manifested a willingness to have samples taken, thereby securing an index of the product they were dispensing; with but few exceptions, it was gratifying to note their attitude. On the whole, they were ready to accept suggestions and showed their intention to conform closely with the spirit and the letter of the law. The attempt was made in the settlement of all such cases to deal impartially and fairly, and to effect a satisfactory agreement; to remedy the conditions found to exist; to protect the public and also the dealer, without the disagreeable features of court proceedings and notoriety, trusting that as much good could be accomplished in that way.

In all, two hundred and fifty-eight samples of drugs were collected, and one hundred and four hearings were arranged relative to adulteration and misbranding.

The results of all analyses of drug samples are to be found in Official Inspections No. 61.

Foods Inspection.

In the enforcement of the Food Law and in the work of food inspection, the methods adopted were similar to those employed in the enforcement of the drug requirements, namely, along the lines of education, inspection and prosecution, and, as stated in regard to drugs, the collection of samples represents only in a small way the amount of work accomplished.

GROCERY STORES AND MARKETS.

The information gathered relative to dispensing foods in groceries and markets has been rather complete. The questions on the reports employed by the inspectors, if satisfactorily answered, indicate the general condition of the places visited as to the cleanliness of walls, floors, shelves and counters, and, in the fly season, if screens are used. Meat rooms and refrigerators are examined and their condition reported. The cleanliness and general health of the employees are also noted, information which should be regarded as most important. The inspectors also improve this opportunity to question and note whether the dealers are properly marking their compounds of lard, molasses, sausage and vinegar, if sold in substitution for pure articles. Notes are also made as to the wrapping of bread and the general habits in protecting the food when displayed for sale. As a result of the above information communicated by the inspectors, letters of warning—if violations have been reported—have been written, or, in cases of flagrant offences, court proceedings have been instituted. It is gratifying to report that the enforcement of the phases of the statute regulating the sale of foods, other than those where a sample must be collected and analyzed to prove misbranding or adulteration, has been successfully tested in the courts of the state and conviction secured under this act. The sections referred to are those making it unlawful for any person to manufacture, sell, distribute, transport, offer or expose for sale, distribution or transportation, any article of food that consists in whole or in part of a filthy, decomposed or putrid animal or vegetable substance, or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a diseased animal, or one that has died otherwise than by slaughter; or if in the manufacture, sale, distribution, or transportation, or in the offering or exposing for sale, distribution or transportation it is not at all times securely protected from filth, flies, dust or other contamination, or other unclean, unhealthful or unsanitary conditions.

Under the above statute, offenders who have violated the law in the sale of meats, fruits, etc., or by unsanitary exposure of foods, have been brought to justice and the strength of the law determined. These violations varied considerably in nature, from the sale of the carcass of an animal unfit for food, to the exposure of confectionery not sufficiently protected from contamination. Among other educational features of the enforcement, it was deemed of sufficient importance for the inspectors to call the direct attention of the dealers to such violations when they have been noticed, as well as to report them to this office, and in August a regulatory announcement, enumerating the different articles requiring protection, was issued from this bureau and distributed to the dealers by the inspectors in the towns and cities visited.

In the early spring, a large warehouse that was located in Portland, burned. In this building large quantities of canned goods and other food products in bulk packages were stored. It is hoped that valuable service was rendered at this time by carefully tracing out and regulating the sale of salvaged goods. As a result of this fire, a portion of the canned goods was entirely destroyed, and in the disposition of the remainder the proper protection to the consumer was afforded under the Pure Food law. Inspectors watched carefully the recovery of large quantities of sardines, canned tomatoes, canned apples and other miscellaneous food products, and in some cases personally inspected the reclaiming process of canning; in other instances, where carload shipments entered interstate commerce, the Federal authorities were notified as well as the food officials in the state where the cars had their destination.

FAIRS.

With your consent and approval, inspectors of the bureau were delegated to visit the different fairs throughout the state for the purpose of advising those dispensing food products regarding the requirements of the law and to see that the same were obeyed. This, in some instances, was difficult as many were unacquainted with the provisions of the statute. However, it is hoped that much good was accomplished, and in general the people who were dispensing food showed a willingness to coöperate with the inspectors and to comply with the law. As the arrangements were in many cases temporary, it could not be expected that the most approved methods would be employed for dispensing food.

FOOD FACTORIES, ETC.

In food factories, canneries and bakeshops, a careful index was gathered by the use of the tabulated reports answering definite questions as to the general sanitary conditions, cleanliness of walls and floors, the ventilation, proper location of toilets, the health and cleanliness of the employees; and the inspectors were also instructed to ascertain the source of the raw materials used in preparing food.

It is to be regretted that we have been unable, with the force of inspectors employed and the opportunity afforded, to carry on as complete an inspection of canneries and food factories, also slaughter houses, as we wish we could report.

Under chapter 151, P. L. 1911, amended by P. L. 1913, chap. 140, an opportunity is given and an option granted for packing food in conformity with the requirements of the Maine Food law. This requires registration and payment of registration fee, and calls for official inspection by inspectors of the department. During the year 1914, however, not one of the canners in the state took advantage of this inspection relative to the packing of food.

RESTAURANTS.

In the inspection of restaurants, hotels, lunch rooms and lunch carts, careful investigation has been made of the kitchens and the light and ventilation of these places; here, as in stores, the health and cleanliness of the employees are also judged. Reports are made as to the condition of the dishes and utensils used and of refrigerators and coolers as well. I regret to report that it was our unpleasant duty to recommend the discharge of certain restaurant employees, owing to their unhealthy condition. It is gratifying, however, that the management readily followed the suggestions made when such unfortunate conditions were brought to their attention.

Collection of Food Samples.

The principal food products collected for analysis have included sirup and molasses, sausage, condensed milk, rice, pickles, clams, oysters, and rather extensive collections were made of ice cream. The sampling for maple sirup, oysters, clams and ice cream, has been general, collections having been made in most of the cities; the other articles mentioned have, for the most part, been taken for special reasons.

SIRUP AND MOLASSES.

During the early spring, the inspectors made collections of several brands of sirup; some sold for imitation maple sirup and some for the pure article. Several samples were found to be adulterated and misbranded, and the necessity for remedying these conditions was made apparent. It was also our duty to report the results of the analyses of numerous samples of molasses which had been collected during the previous year. In a few instances the molasses examined was found to be of inferior quality and hearings were arranged; these cases, however, were satisfactorily settled and prosecution was not warranted.

SAUSAGE.

The collection and analyses of samples of pork sausage did not reveal any serious adulterations. It is a practice apparently employed by most of the manufacturers to add more or less water, and it is also known that considerable cereal is used; while none of the cases investigated have shown intentional adulteration, cases have been found where water has been added in excessive amounts, and an attempt has been made to enforce the requirements providing for the labeling of pork sausage to which cereal has been added and which contains more water than would naturally be found in the meat from which the sausage is made.

The results of the analyses of the above samples are found in Official Inspections No. 65.

ICE CREAM.

During the summer, particular attention was paid to the collection of ice cream samples which were obtained from a wide range of territory. Particular care was taken by the inspectors to bring to the attention of ice cream manufacturers in an educational way the requirements under the law, and copies of these requirements were distributed extensively. In general, the inspectors have reported a willingness on the part of the manufacturers to comply with the law and they have also reported that very little fault has been found with the standard that is required. Another feature noticed among these dealers was the spirit of competition and a jealous guarding of their formula. This is a departure that should be encouraged, as it has a tendency to raise the standard even above that required by the statute.

Among the samples of ice cream obtained, especially in some of the coast towns, a deficiency in milk fat was found. In all such cases a hearing was arranged and an explanation for the deficiency requested. In some cases the use of eggs was responsible for the reduction of the milk fat content, but it is very gratifying to report that not one case was investigated where to our belief an intentional violation could have been proven. The results in general obtained by collecting and analyzing ice cream samples have been most encouraging, and it is with a feeling of great pride that the statement is made that the people of Maine are supplied with ice cream that is not surpassed anywhere. This is not due so much, perhaps, to the careful enforcement of the law as to the existence of a fair standard, sharp competition among the producers, and honesty and integrity of the manufacturers. Having been informed by dealers whose samples of ice cream have shown a high milk fat content that a good profit is made on a product that will analyze well above the standard, and taking into consideration the fact that large quantities of this healthful and valuable food product are being shipped to this state, there seems to be a broad field for added manufacture by our own people, thus giving an outlet for dairy products at a market nearer home.

The results of the ice cream inspections will be found in Official Inspections No. 63.

CLAMS AND OYSTERS.

General sampling—in the cities in particular—was done on clams and oysters and while conditions have been remedied as shown by more recent collections, there is still a great chance for improvement. This sampling for these products was carried on in the early spring and, again, during the autumn months. While oysters and clams are both considered as condimental food, carrying small nutritive food value—sold often as a luxury—there is no excuse for selling them in an adulterated form. I regret to announce that the results of analyses in many cases have shown low total solids and a high water content. The practice of soaking clams and oysters in order to swell them has been strongly advised against and prevented when possible; when deemed necessary, prosecutions have been made.

In attempting to regulate the sale of these commodities, we have greatly appreciated the fact that the Rhode Island Shell Fish Commission and the wholesale dealers have given us the assurance of their heartiest coöperation.

IN GENERAL.

Few complaints relating to suspicions of adulterations, or the quality of any particular food products, have been received. Whenever a complaint has been brought to our attention, however, blanks have been forwarded to the complainant with full directions for taking and forwarding samples for analysis; when the circumstances warranted, an inspector was detailed to investigate the alleged violation carefully, prosecution being made if sufficient cause was found. It is sincerely hoped that the law properly enforced is having the desired effect and that the reason so few grievances have been reported is that the people of the state are not being imposed upon, rather than that the silence maintained by the army of consumers has been due to the fear of publicity had violations been reported to the proper officers charged with the enforcement of the law. It seems most desirable that the taxpayers should at all times take advantage of this bureau which is maintained for their protection; this is not only true regarding the insurance of human food, but it should be well understood by the agriculturists that the law of which this department is executive protects the seeds they plant; the fertilizer used for plant food; the spraying material for the protection of plants from the attacks of fungi and insects; and the feeding stuffs for domestic animals, as even these last named commodities, in order to be legally sold, must be of good quality, unadulterated and properly branded.

Public sentiment in general seems very much in favor of the Pure Food law and its enforcement. Most of the dealers have welcomed the visits of the Pure Food inspectors, and, aside from the desire to keep within the requirements of this law, its enforcement is being seriously considered by grocers and restaurant keepers from an economic standpoint, as it is realized that by following the advice of the inspectors to "Swat the fly" and "Bat the rat," the waste of stock is avoided, their profit increased, and their business benefited.

Milk Inspection.

With the resignation of the Milk Inspector, who had this work in charge—his resignation occurring in October—the inspection work of milk and other dairy products has been added to the duties of the Bureau of Inspection. Methods of inspection were adopted along practically the lines previously employed. Care has been taken to make the sampling of milk as complete as possible in every town visited, and occasional inspections were made of dairy barns and milk rooms. The inspectors have also investigated the sale of renovated butter and oleomargarine, but most of the work was confined to the collection of milk and cream samples. The number of samples of milk and cream collected since October was four hundred and sixty. As ordered by statute, these samples were analyzed at the laboratory of the Maine Experiment Station. The results of the inspections on the whole were very satisfactory and out of the samples collected only a few showed a deficiency that warranted a hearing or even a request for an explanation. There are still many changes to be suggested in the milk situation. In some instances it seems necessary to caution milk dealers to take more care to produce a clean product; some of the provisions of the statute should be more carefully observed by milk dealers, as in numerous cases no license number is displayed on the wagon, although this is required by law and should be observed; people are selling milk without a license—in some cases from stores—and it was discovered that a regular milk business had been carried on from a delivery team although no license had been procured, which seemed inexcusable, as obtaining a license carries no expense other than postage for an application. It has been noticed that in some cases, when selling milk from cans, the product has not been dispensed consistently. Care should be taken to turn the can frequently so the cream may be well mixed with the milk, thus insuring a standard quality when portions are drawn. It is also recommended to milk dealers that they adopt some method during the winter months to prevent milk from freezing in their delivery wagons, as freezing renders milk more liable to decompose, injures its keeping qualities, and consequently increases its unfitness for food.

The demand for clean milk, or any legislation framed to insure a clean product, should be drafted with care so that in no way will it resemble prohibition but rather a regulation of the sale of this useful food product. It must also be understood by the consumer that if clean milk is expected a corresponding increase of the cost of milk may be expected as well, with the high price of feed and increased cost of production. Without attempting to quote, I recommend that the most valuable information recently given along these lines is contained in Farmers' Bulletin 602, published by the United States Department of Agriculture at Washington, entitled "The Production of Clean Milk."

Our report of the milk inspection work must necessarily be brief, as the bulk of the work accomplished during the year is comprehensively covered in the report of the former milk inspector.

The Net Weight Law.

The Net Weight law was passed in 1913 and statutory provision of enforcement entrusted to the Department of Agriculture with other provisions of the Pure Food law; in this way the responsibility was charged to the Bureau of Inspection.

The law provides that every package of food if sold at a greater price than five cents, shall bear a plain and conspicuous statement on the outside indicating to the consumer the quantity of the contents. A clause was included in this law providing that no enforcement should be made until September third, 1914, and thus an opportunity was given to canners, packers and manufacturers of food to change their labels and have new labels properly printed. The date selected for the enforcement of this law was the same as that on which the Federal Law became effective, namely, September third, 1914. Since that date, throughout the remainder of the year, special endeavor was made to acquaint the people with the requirements of this act and to call to their particular attention the commodities coming within the scope of the law and advise the proper marking. It seems advisable to quote for the information of all concerned the definition of "food" as given in section 2 of chapter 199 of the P. L. of 1911, which is the definition to be understood as governing the requirements under section 23 of the same chapter, and reads:

"The term 'food' as used herein, shall be held to include all articles, whether simple, mixed or compound, used for food, drink, confectionery, or condiment by man or other animals."

The work has been largely accomplished by actual inspection of the stock on hand in the stores visited. Two of the inspectors have been employed in this way since the law became effective. The other inspectors of the Bureau, charged with general inspection, were also instructed to note the markings of packages while attending to their other duties. The findings were most interesting and, in general, the spirit in which the requirements of the law have been met by the dealers has been most gratifying.

The two commodities which seem to have been most completely overlooked in the matter of meeting the requirements of this statute are products that are universally used every day in the year, namely, butter and bread. Considerable comment has been caused by the butter manufacturers—as butter has been brought within the scope of this statute—and complaint has been made that in order to meet the requirements of the law they would be subjected to additional expense and the work would be attended by more or less hardship. This in a way is acknowledged, realizing that in many cases the persons engaged in the manufacture of butter do not have the proper facilities for moulding and accurately weighing their product; however, it is believed that in almost every case the procuring of scales and the accurate weighing of butter before selling would be of advantage aside from living in conformity with the law, as no doubt butter is sold over weight in many instances. It seems reasonable to suppose that the sale of any product can be best accomplished by knowing accurately the amount exchanged for money value, and the cost of production thus more accurately computed.

In the adoption of a correct label for butter, the manufacturers of this product have usually included their name and address with the required net weight, an action that is commendable.

In the marketing of bread, some little difficulty has been experienced on the part of the bakers from outside the state. The point has been raised as to the consistency in asking that the requirements be complied with if the wrapper bears the statement "One loaf." As we have no provision of the statute defining the weight of a loaf of bread, the only reasonable solution of this problem seemed to be to insist that the quantity of the contents should be plainly stated on the outside of the wrapper. The bakers within the state have apparently taken special pains to meet the requirements of the law. In reply to the requests for information as to the requirements for marking the net weight on bread and butter, a point has been made by dealers and they have signified their intentions of evading the law by selling bread and butter unwrapped. When such action has been intimated, they have been reminded of the existence of another clause and section of the same chapter, providing that food shall be deemed adulterated "if in its manufacture, sale, distribution, or transportation, it is not at all times securely protected from filth, flies, dust, or other contamination, or unclean, unhealthful or unsanitary conditions." With this clause in evidence, it would be hard to accomplish the sale of these products without the violation of this part of the act, and the discontinuance of wrapping bread or butter is strongly advised against.

Among other articles found by the inspectors to be misbranded—that is, not bearing the language announcing the quantity of the contents plainly and conspicuously—are numerous brands of confectionery, figs, jelly, honey, potato chips, and several kinds of canned fish including mackerel, tuna, clams and oysters. It has been necessary to write to the various violators, calling their attention to the absence of proper branding and also defining carefully the meaning and intent of the statute.

Many inquiries have been received through correspondence, and also personally made to the inspectors, as to the interpretation of the statute providing for the marking of packages of food sold from bulk, and the usual advice given has been that it was not considered the intent of the law to require articles weighed and wrapped under the observation of the purchaser to bear the marks showing the quantity of the contents. Dealers have been informed, however, that if goods sold from bulk packages were weighed and wrapped not under the observation of the customer, the articles so treated must bear the marks denoting the quantity of the contents in conformity with the law.

Numerous phases of the law are yet to be decided and, owing to the meager knowledge at our command for establishing tolerances in justice, such rulings for tolerances and variations have not as yet been established. It might be well to state that numerous experiments and careful investigations are being conducted by the Federal bureau along these lines and it is hoped that correct information and valuable assistance may be given when the establishment of such regulations becomes a necessity.

Very few samples have been taken thus far and, as the work goes on, it will probably be necessary to make a special collection of samples in order to ascertain as to the correctness of labels; for the present, however, it seems consistent to proceed slowly and almost entirely along educational lines.

It should be borne in mind by the agriculturists and by the consumers as well, that other provisions of the statute, the enforcement of which is entrusted to this department, provide that every package of fertilizer, every bag of feeding stuff, every can or package of spraying material, shall bear in a conspicuous place on the outside of the package the quantity of the contents. This is also true of all articles of food for human consumption. If a farmer, therefore, carries to a grocery store one pound of butter bearing a wrapper showing the quantity of the contents, he is also entitled under the law to receive a package of tea, coffee, or any other article of food, properly marked in conformity with the law. It would seem that under these conditions there is no chance for the charge of discrimination.

CORRESPONDENCE.

The correspondence of the Bureau of Inspection has necessarily been large, as the work has been conducted along educational lines to a great extent. Whenever technical violations have been reported by the inspectors, not sufficiently flagrant to warrant a hearing or prosecution, letters of warning have been written relative to the exposure of foods, marking of compounds, general unsanitary conditions, and other minor technicalities. The replies received have been most gratifying.

Aside from the correspondence of the above nature, there is that necessitated by the registrations. Labels have often been presented by manufacturers to be passed upon by the bureau. and these inquiries have always been given prompt attention. Whenever judged expedient, opinion as to the legality of the labels has been given, as we have considered it our duty to assist the manufacturers in every way possible in insuring wholesale food products to the consumer, properly branded with a true statement of the exact nature of the goods the label describes. These opinions have, however, been given reservedly.

Conventions.

I also wish to report that it has been my pleasure, with your approval, to attend three important meetings during the year: a meeting of the Food, Dairy and Drug Officials, and Chemists, held at Boston, May fifteenth, at which all of the New England States were represented; the Annual Convention of the Association of American Dairy, Food & Drug Officials, held at Portland, July thirteenth to eighteenth, at which twenty-nine State Departments, and numerous representatives from the Federal Department, were present and on November sixteenth, a meeting of the Food Control Officials held at Washington, D. C. The last named meeting was in session at the same time the Feed Manufacturers' Association was held.

The privilege of attending these gatherings was greatly appreciated and much benefit was derived as the opportunity was given for the discussion of papers, for listening to lectures bearing on food subjects, and for meeting with earnest and interested men who are serving as food officials and chemists and who bear a national reputation.

In closing, I wish to sincerely thank you for the encouragement and endorsement you have given my efforts in performing my duties during the year. I also desire to express my appreciation and thanks to the Attorney General and his assistants for their services; to the attorneys in the counties where prosecutions have been made; to the members of the Department of Agriculture of this state as well as to the chief and other officers of the Bureau of Chemistry at the United States Department; also the indebtedness I feel to the director of the Maine Agricultural Experiment Station, and the chemists at the laboratory, for their close coöperation in the work pertaining to this office.

Respectfully submitted,

A. M. G. SOULE,

Chief, Bureau of Inspection.

REPORT OF PROCEEDINGS

OF THE

STATE DAIRY CONFERENCE AND ANNUAL MEETINGS

OF THE

MAINE DAIRYMEN'S ASSOCIATION

AND

MAINE SEED IMPROVEMENT ASSOCIATION

CITY HALL, BANGOR,

DECEMBER 8-11, 1914.

TUESDAY EVENING, DECEMBER 8.

Meeting opened by Hon. John A. Roberts, Commissioner of Agriculture. Music. Invocation by Rev. Ashley A. Smith, Bangor.

ADDRESS OF WELCOME.

JOHN G. UTTERBACK, Mayor of Bangor.

I am very happy to extend to you tonight a hearty greeting on behalf of the citizens of Bangor. I welcome you to our city, and we trust that your deliberations may be profitable as well as pleasant. A convention of this sort coming to our city is a great benefit to us, bringing to us, as it does, the very best citizenship of the various localities of the state. I am a firm believer in the encouragement by us in every way of the coöperative spirit as applied to farming or manufacturing interests, to any industrial interests, or even to municipal affairs. Certainly in coöperation great benefits may be derived; and I believe that particularly at the present time the citizens of Maine are beginning to realize more and more the benefits to be derived in this "get-together" spirit. I believe that Maine has perhaps not been as progressive on lines of that sort as some of the states west of us, but forces are at work in various ways that are bringing about a happier condition, a condition that promises well for the state.

I do not know that there is anything of special interest I could offer to the dairymen. Certainly I do not know much about dairying, although I remember as a boy the various cows I milked and the troubles I had with them. I would offer this suggestion to the dairymen and the seed men, and to all of you who are particularly interested in agricultural lines,—that you encourage the young people, especially with reference to the scientific idea of farming. I think that farm life can be made more attractive to the younger people, so that they will show a greater disposition to remain on the farm and grow up on the farm. I notice in the papers that I get from the west that in about all the fairs out there they have competition classes of boys and girls, in dairying and stock raising, and in the judging of cattle and horses, and I would like to see some such thing as that at our Maine fairs. I think generally our Maine fairs are not as progressive as they should be. Perhaps we could awaken a greater interest in fairs generally, if the younger people were more interested. We are looking today at the practical side of things.

We believe we have an ideal convention city, situated as we are near the center of population of the state, with splendid hotels and good shopping facilities, and we want to extend to you a welcome that is so sincere that it may impress you with its sincerity and its cordiality and that we may have the pleasure of seeing you here again in the near future.

RESPONSE.

W. G. Hunton, Cherryfield.

I appear before you tonight as a drafted man from the ranks. I was not selected for this until a few days ago, but I wish to say in behalf of the Maine Dairymen's Association and the Maine Seed Improvement Association that we know full well what the hospitality of Bangor is. While I wish to thank your Mayor for the cordial welcome which he has extended to us, we felt sure of that welcome when we first heard of the invitation to come to Bangor. We have been here many times before and we certainly feel pleased whenever opportunity offers to come to this one of the northern cities of our state, one which has ever responded so heartily to the appeals of every agricultural enterprise that was ever started in the State of Maine. Your Mayor spoke tonight of that wonderful thing, coöperation, especially in connection with our agricultural interests. When these associations were first formed—and there are many of us who assisted in the formation of both of them—they were formed almost entirely for the educational advantage which they should be both to the producer and to the consumer; and we have but to look at these exhibits tonight and then think back in our own minds to what our exhibits were in former years, to feel well satisfied with the progress that has been made in educational lines. But when I listened to that word it seemed to me that today there is developing another feature, one that we did not understand when we first incorporated these two great associations, that is taking the lead of all that we have hoped for from coöperation; I refer to this new idea which is so fast developing, of fraternity,—how much one class of individuals in this state, in this country, in this world, is dependent on all other classes.

In other words, I think that the word "coöperation" is embraced in a greater thing, a more noble motive, that which teaches us our dependence upon each other, and more than that, the Brotherhood of Man. It is our task to produce the best that we can and offer it to the consumer, and already he is stretching out his hand towards us and nobly endeavoring to assist us in producing and to meet us half way in the consumption of that article, and to encourage us to produce it better and in larger quantities. The question that is interesting the consumer today is not how much we shall produce, but he is saying, "Give us more of these products of Mother Earth that we may enjoy them to the fullest extent, that we may take them with us to the cities where our labors exist and there partake of the same bounty which you upon the farms are partaking of." In the past the farmer's first thought was to produce simply enough for his family. If there was any surplus he took it to market. That time is past. When 25 per cent of our population are engaged in production, it means that the other 75 per cent are dependent upon the surplus which we produce. Therefore let us as the representatives of this association meet the consumers half way with a fraternal hand, and meet them with this idea,—that in the future we will extend to them the same hearty coöperation, the same feeling of the universal brotherhood of man which they extend to us; that we will give them a bushel of oats without any charlock; that we will give them a bushel of potatoes without any scab, and that will weigh 62 pounds; and that we will give them a barrel of apples that shall be No. 1 from the facers to the bottom. Let us extend to them this feeling and we shall have no cause in the future to regret that we are doing our part nobly in feeding the world.

VOCATIONAL EDUCATION.

Dr. Robert J. Aley, President, University of Maine.

(Stenographic Report.)

There is perhaps no subject that is of so great interest to all of us as the subject of education. We are interested in it for what it is doing, for the achievements of the past, but more particularly for what we believe it may do for the generations that are to follow us. It is the desire of every man and every woman that the next generation shall be stronger and better than this and shall be prepared to live more completely than any preceding generation. It is this rather fundamental feeling that always makes the subject of education one of interest.

The term, education, is difficult to define because it represents a fundamental notion that is continually changing. A definition big enough to include every idea in education held at present, would not be adequate 24 hours from now, because in 24 hours of time there would be growth and new ideas and consequently changes in the conception of education. The old idea of education was that it was something that could be gotten from books, that it was definitely limited and that might be finished. The old education had to do with mind and with mind alone. There was very little notion of the application of thought to the affairs of men. Indeed, many held that for an educational subject to have real value it must be free from the taint of bread and butter; it must have in it nothing that might contribute to the gain of the individual who possessed it. Ideas, when once they have taken hold of the human race, are slow to change. One continual warfare among men is the warfare against conservatism, the warfare against the fixity of ideas. Although civilization has gone on and upward, making many changes for the better, there has been a continual contest with the set and established forms of education, by those interested to keep organized education in harmony with the developing life everywhere about us. We are today realizing better and more clearly than ever before, that there are many educational forces in the world. A generation or two ago the common notion was that the school was the only educational factor. It was hardly admitted that the home, the state in its political relations, the business activities of the community, and society in its organized forms, had any effect upon the education of the individual. These forces helped to fit the individual to his surroundings, but they were not recognized as educational in the technical meaning of the term.

As society has developed new forms of activity, new forms of industrial grouping, new desires transforming the luxuries of yesterday into the necessities of today, there has grown up a marked need of special adaptation to the new kind of life. The old form of education that fitted the individual fairly well for the smaller life of fifty years ago, hardly fits him for the kind of life that he must live today. The man who sighs for a return to the simple life of yesterday, is sighing after all for a thing that he does not really want; for when you question him you find that he would like to take back into that simple life his automobile, his telephone, his daily paper,—all the things he enjoys and now finds necessary. He imagines if he could get all these back into the simple life, that the simple life would be intensely interesting and happy. It probably would be but it would no longer be simple. Life will never again be simple. The wheels of the world's progress do not turn backward. This life will grow more and more complex, and as its complexity increases the need of the individual for training and development that will adjust him to this complex life grows greater and greater.

Some thirty or forty years ago a few of our educational leaders began advocating the introduction of manual training into the schools for the purpose of fitting young people better for the life they would necessarily enter as men and women. Manual training had at first a gradual, and in recent years, a very rapid growth. It was believed by its advocates that it would equip boys with the ability to earn a living. Time enough has elapsed since its introduction to prove rather conclusively that the claims of the early advocates of manual training were not well founded. Do not misunderstand me. Manual training has been a great addition to our educational practice. It has rendered a helpful service but it has not developed skilled mechanics. It has not made young men able to earn a living in a trade. It has rather had the effect of giving boys, and, later in its development, girls, an added interest by appealing to them on the concrete side and thus helping in the development of their intellects. The manual training idea and practice is worthy of high commendation. It has saved thousands—tens of thousands—of boys, for it has given them a new impetus, a new desire to develop their minds. But, as I said a moment ago, it has not made them mechanics. At the very heart of it, it has never intended to do that. You cannot give to an individual a vocation by a few hours' work a week. You can give him a certain interest in things and through that interest you may develop in him a desire to improve himself.

There has grown up in recent years an insistent demand, coming from many quarters, that our boys and girls be given a chance to prepare specifically for a vocation, the preparation to be of such a character as to fit them to earn wages as skilled mechanics. Education of this sort takes the name vocational, or industrial. In its higher form it is known as technical education. The language of this new form of education has not yet been well defined, and so there is a variety of terms applied to almost the same idea.

Is there a need in this country for some sort of specific training for a vocation? I think it will require no argument to get your consent to an affirmative answer. America perhaps more than any other of the highly civilized countries of the world, suffers industrially from untrained, unskilled workmen. In the great manufacturing centers we find that the managers of factories have a tale of woe because of the lack of skilled workmen. There are a few reasons why this condition exists. In this country more completely than in most other countries the apprenticeship system has broken down. It seems that in a Republican form of government like ours the apprenticeship system is rather repugnant. It savors too much of slavery and so does not have a very great foothold in America. Some of our states have recently enacted apprenticeship laws that promise to give some relief. It is likely, however, that it will be very difficult to ever develop in America an adequate system of apprenticeship to supply the trades with skilled journeymen.

In America more than in most countries, manufacturing industries have been specialized. I mean that in the production of the finished product many individual workmen have taken part, one devoting himself entirely to one small part of the finished product and another devoting himself to another part. I was reading only recently that in the manufacture of a shoe there were some forty distinct processes in the most highly specialized factories, and that in the making of a shoe 40 individual workmen gave their attention to it, each performing a small part. This tendency, which perhaps will never be overcome because of its economy, has had much to do with the retarding of the development of skilled workmen. It has a very peculiar effect, I think, as you can readily see, upon the workman himself. The individual, who year in and year out, devotes himself to the production of one little part of a finished product becomes in time a mere machine in the doing of that thing and if in the transformation that is going on, that particular part which he does should be turned over to a real machine, he has become so much of a machine that it is very difficult for him to adapt himself to any other kind of work. Being an unskilled man, other than the skill that he has in that one little narrow field of work, handicaps him in making a living when he happens to be thrown out of employment.

Child labor, that has been so profitable in many of the great manufacturing industries of this country, is another reason why we need some sort of real vocational training. There is no more abject sight than a full-grown man working at a boy's job. Child labor has a tendency to stunt the individual so that when he arrives at the years and the stature of manhood he is unfit for anything but a child's job.

These are just a few of the reasons why there exists in America today the need of some sort of training that will equip boys and girls with a vocation. The need is not limited to America by any means. European countries have felt this need and have been trying to respond to it for years. It need not be said to an audience of this sort that mere intellectual training will not give the equipment that is needed. It need not be said that mere training in moral precepts and the development of character will not meet that case. Man is a triune being. He has his physical, his mental and his moral side. Development in any one of these is not sufficient to make out of him a man who will fit into his environment and be the kind of man that he ought to be. He should be developed in all three.

I wish to present some of the methods that have been tried in America and in Europe to meet the condition which I have described, the need of a larger body of men trained for a vocation. How shall that need be met? The answer that comes from the lips of many very glibly is, by establishing trade schools. I am using that term "trade" in its larger sense, to include any sort of a vocation that requires skill and training. Certain it is that the trade schools, properly managed, under proper conditions, would meet the need, but there are certain difficulties that it is worth while to consider.

In the first place, the trade school is exceedingly expensive. If you were to establish in Bangor or any of the cities or the towns of Maine, a trade school, you would find that the per capita cost would be very great. The best estimates growing out of experience in this matter, show that in a trade school the cost per pupil is from three to seven times the cost per pupil in an ordinary school.

In the second place, it is very difficult, if not entirely impossible, to reproduce in a school, actual shop conditions. The greatest difficulty that has been encountered by trade schools already in operation is found just here. It is very difficult to get a man who knows a trade and who, at the same time, is competent to teach it to a group of young people. The skilled workman cannot teach and the competent teacher is not a skilled mechanic. Another very great difficulty is that of the economic use of material. It is difficult under school conditions to have material used under trade conditions so that proper economy is looked after every time.

Another form of school that has been tried with considerable success is what is known as the "part time" school. It is possible because of a coöperation between the organized school of the community and some factory or factories of the same community. Those young people who wish to learn a particular trade go into that factory for a half day; or they go into the factory for a week and then to school for a week. This form of school is in actual operation in Boston, in Cincinnati, and in quite a number of other American cities. The school work of the pupils who are learning a trade bears as directly as possible upon the matters relating to that trade. If it is a trade that involves the reading of blue prints part of the school work consists in making blue prints and drawings. Some of the school work will involve a study of the material that goes into the product and an investigation of the use, demand and sale of the product. There is a combination in this "part time" school of the actual learning of the trade under trade conditions with a development of the mind of the individual along lines that are related specifically to the trade that he is learning. This sort of school has been used in a number of European cities with very great success. It is having a successful trial in quite a number of our American cities. It is even being pushed up into higher education. The University of Cincinnati, one of the few municipal universities in America, has an arrangement of that sort for its students. Large numbers of the college students of the University of Cincinnati work half time in some of the great industrial plants of the city and spend the other half of their time in university halls. The combination is satisfactory so far to both the manufacturer and the university, just as the combination with younger people is satisfactory in the cities where that is being tried.

Another form of school, working upon this same problem, is what is known as the Improvement School. The Improvement School had its origin in Continental Europe. It originated in one of the cities of Germany where it started as a Sunday school, meeting at a time not to conflict with the hours of worship. The school lasted for three or four hours each Sunday and sustained classes for workmen from the various factories. The workmen from a particular industry were formed into one class, and those from another industry into a different class. The instruction bore directly upon the particular problems that confronted them in the work they were doing. They brought from the factory the questions about which they wanted more information. The fundamental desire of the school was to help these men to a little higher level in the vocation which they had chosen; to make out of them a little better workmen than they were; to make it possible for them to have a larger view of their own trade; and to give them, so far as it was possible in a brief time, that mental alertness that would make it easier for them, if changing conditions threw them out of the employment they were in, to adapt themselves to some new form of wage earning. These schools soon felt the need of longer time than could be given on Sunday and so meetings were extended into the evenings of the week and they became night schools. In hundreds of cities of Europe these schools have done much to help men and women into a better understanding of their vocation, and have made it possible for them to be worth more to their employers and therefore to receive larger wages.

In this country we have within the last half dozen years, seen the rise of what is known as "short unit" schools. These schools have generally been under the direction of the Young Men's Christian Association or some other philanthropic organization. Their purpose has been to help men in the most direct way possible. As I have already indicated, the industrial world is constantly changing. A new invention at once transforms a whole industry, and develops the need of a new kind of workman. For instance, the invention and wide use of the player piano has created a great need for piano tuners who can tune the new sort of instrument. The piano tuner who was thoroughly acquainted with the anatomy of an ordinary piano found that when he opened up a player piano the anatomy was so different that he was simply staggered. It was only the unusual tuner who could adapt himself to the work of tuning this new type of piano. Some months ago a "short unit" school for tuners of player pianos was held in New York City. I have forgotten the exact number but it seems to me there were 60 to 70 who responded to the invitation to come to this school for eight or ten lessons. The player piano manufacturers were all intensely interested because the success of their instruments depended largely upon their being kept in tune, so these manufacturers brought their pianos into the hall where the school was to be held. They were all opened up and somebody was there who could explain the anatomy of the new type of instrument, and then a man who knew how was there and in a few lessons these men were equipped with the power to do the thing they had not been able to do before. You can see how this idea may be extended to a great many fields, and how valuable it is that men and organizations are willing to provide an opportunity to fit men for new conditions.

A question of importance is: How far shall the public go in supporting the education that trains for a vocation? In other words, Is it a part of the business of the state to train young people for a vocation? It has already been accepted as the business of the state to train young people to read, write and cipher, and do all the things that are now in the curriculum of our schools. Such a question is worthy of our serious consideration. We are already training at public expense for a good many vocations. There are, in the city of Bangor, a good many young men earning their living as book-keepers who have got their training in the public schools. There are, in the offices of business and professional men, a good many young women stenographers who have learned the business of stenography in the public schools. Probably all the teachers in the schools of Maine learned their vocation at public expense. It is already established that certain vocations are prepared for at public expense. How far shall we carry this idea? I do not know. It will be a development. Already there are indications that the public will ultimately demand training for many vocations. What shall these vocations be? Here are some serious matters. Suppose that in a city as large as Bangor the school committee should undertake to offer training in a vocation, what vocations should be selected? There are a good many vocations in the city of Bangor. What ones will you select? You could find towns in Maine, with a population of two or three thousand, where the vocations, of course, are limited. There would probably be agriculture and some textile industry, and these might be practically the only ones. It would be a comparatively simple matter there, provided the population was stationary. But one of the peculiar things about the American population is that it is not stationary. The Mayor of Bangor was telling a little incident a while ago that illustrates that. He said that after he had been in Maine a little while it came time to vote. He went to the place of registration and as he answered the various questions, the registration officer said to him, "The second man before you was from Ohio, the man just before you was from Kentucky, and you are from Indiana." That is a common occurrence. Now if you should train in any community for only the vocations represented in that community, ten years after the young people have been fitted for some vocation the majority of them, or half of them, will be somewhere else, and they may be where the particular vocation for which they are prepared is not represented at all.

I am simply mentioning some of the problems; they are hard ones; and yet I believe we will meet this insistent demand for vocational training. How we are going to meet it nobody knows yet. It is a problem worth thinking about, however, because as I said at the beginning, this problem of education is the greatest problem, the most interesting problem, that confronts us in America today, because our whole future is wrapped up in it.

There are a few things, it seems to me, that we must not forget in our thinking about vocational education. In the first place, the schools that are now established can render a far greater service if their attention is turned toward vocation more than it has been in the past. Many young people select a vocation largely by chance. I believe that the school could contribute greatly toward a real vocation in after life by having the boys and girls give attention to the various requirements of vocations and what they will ultimately mean so far as permanency of employment is concerned. What are the qualities a man should have who is to succeed in a selected vocation? What are the chances of rising in a certain vocation above the ordinary workman? There are a great many questions that come up. I have in mind now a school in a western city that for the last two or three years has been giving conscious directed attention to this very subject. Every boy and girl has been given a very definite opportunity to find out some of the things about the vocation which he or she may have in mind. A little study of the field of a vocation will many times be a determining factor in the selection or rejection. We suffer in America a great deal from vocations selected at random.

A great deal has been said in recent years about keeping the boys on the farm. Now that is the thing to do if that is where the boy ought to be, but it would have been a sorry day for

America if Daniel Webster had been kept on the farm. Who would have answered Hayne in the United States Senate? Not Webster if he had been kept on the farm. It would be a sorry day for America if this movement to keep the boys on the farm should actually succeed and for the next 40 years every boy born on the farm should stay on the farm. I venture to guess that at the end of 40 years there would not be very many people in this country to whom you could sell your choice products. A very large per cent of the men who are creating the demands for the products that you grow are men who did not stay on the farm. Now do not misunderstand me. If that is the place for the boy, if that is the vocation for the boy, then he ought to stay there. It certainly is true that there are a great many boys who have left the farm that ought to have staid on the farm. There are a great many would-be Daniel Websters that might be real farmers.

I want to make myself clear. It seems to me that in America the very genius of our life as a people rests upon this idea,—the son of anybody may be anything that he is fit to be. It would be unfortunate for us if we should ever get grafted upon our country the caste idea of Continental Europe or the class idea of England. We do not want it ever to happen in this country that the son must follow in the footsteps of the father. He may do it if that is what he is best suited to do, but he should not be compelled to do so. We want it always to be the case that the shoemaker's son may become the president of the Dairymen's Association, and that the son of the president of the Dairymen's Association may become the president of the Bar Association of the greatest city in the country. American growth and development are due to the fact that America spells "Opportunity." We have not had in the past and we must not have in the future a system of education or a system of life that will fix the children in the vocations of the fathers.

This talk of keeping the boys on the farm, when interpreted to mean that the farm must be made far more attractive than it has been in the past, that there must be a greater opportunity there for enjoyment of life, that there must be more thought about the human being than there has been in the past, is a fine thing. But if that boy on the farm, because of his gifts and the strivings within his own soul, ought to be the man who shall call the nation to repentance, he ought to have an opportunity to do so. A study, therefore, in all our schools, a conscious directed effort to learn what all the various kinds of vocations may lead to, an introspective study of the qualities of the individual himself, as to whether he is fitted to this or that or the other vocation, will have a great bearing upon the future interests of our country. I said a moment ago that it seemed to me it would be unfortunate if we should, in this struggle to meet the need of vocational training, fix upon our country the caste system of Continental Europe. In that system, particularly in Germany, it has been the custom for years for the parents and the teachers—the authorities of the state—to decide at the age of 12 or 13 that this boy shall be a wood worker, that boy shall go into the textile mills, and so on. And then through a period of years the whole effort of the school and the shop is to fix the boy in the particular trade selected. It may be that he is utterly unfitted for it. It may be that he has within him the making of something entirely different and better than that, but that is the fact and it is fixed. Nothing, it seems to me, could be more unfortunate for us in America than to ever allow our vocational education to take a form like that, so that we would destroy the possibility of the boy's being what he ought to be. I do not believe there is anybody in this world omniscient enough to tell what a boy at the age of 12 or 14, or even 16, ought to be. You can perhaps get some indication as you study him, as you analyze his traits, etc., and yet the chances are that you are a prejudiced judge after all. It is a difficult problem.

A form of vocational education which most of you are, of course, intensely interested in, is the vocation of agriculture. Here much has been done of a satisfactory type, in some foreign countries, and something is already being done in America. I was reading only a day or two ago a report upon work in Denmark. I found that Denmark has been willing to put into her rural schools larger sums of money than we have yet dreamed of in this country. Her rural schools are almost all of them consolidated. There are very few single room schools, due to the necessary conditions of climate and the topography of the country. Whether it is a one teacher school or a five or six teacher school, she has gone to the expense of building, either as part of the schoolhouse or as adjacent to the schoolhouse, a well equipped home for the teacher. The teacher is on the job 12 months in the year, which is better than having a city girl come out Monday morning and hurry away Friday afternoon. These schoolhouses have ample grounds around them, in fact a small farm. The head teacher is the instructor of the boys and girls of the community in farm affairs. The school farm is a model demonstration farm, and throughout the entire growing season instruction is given there several times a week. The boys and girls at home are working on their own farms. They come to school, to the man who has been trained, who knows; they bring the questions that have grown up in their actual experience and because of their interest they learn definitely and effectively. Here you have a school that is in the highest sense vocational for agriculture. Denmark is doing a remarkable work. There are a few places in America where the conditions in Denmark which I have described are being reproduced. May the number of such places multiply rapidly.

If we are to have vocational education it will cost money, a great deal of money. But after all, nothing costs much that returns more than it costs. If the present generation is trained so as to produce skilled scientific workmen, the output of the farm and factory will be increased and there will come back to the people wealth far in excess of the cost. Therefore the cost is a thing that is not so serious as it might at first sight seem.

Another important question upon which there is wide diversity of opinion is: When this new type of school develops, shall the management be entirely independent of the present school organization or shall it be incorporated as a part of it? Many people believe that it will have to be entirely independent for the reason that if you place it under the management of the present school committees, which are conservative and already intensely interested in the other forms of education, they will not give vocational education a square or fair deal. I confess that there is some strength in that argument. Practical things have usually come into the school against the opposition of those in authority. But I should dislike to believe that it is necessary for us to have two school organizations side by side, one catering to one side of man and the other to the other side. I cannot believe that that will be the final solution. I rather like to think that there are going to be men and women enough in this country who will throw aside their conservatism and see the value of educating the whole man, to make it possible to have under one control the school of the future that shall prepare our boys and girls for life, for wage earning, for vocation, as well as for intellectual and spiritual enjoyment. We need to unite the theoretical and the practical. The two must come together. One is dependent on the other. You never can have the practical without the theoretical, and the theoretical is not worth much unless you apply it somewhere. We are going to unite this development of mind and muscle, this training of mind and body so that the individual will go out able to fit himself to his environment and be an efficient worker for the lifting of civilization to a little higher level. And that, it seems to me, is a consummation worth praying for.

BUSINESS MEETING OF MAINE DAIRYMEN'S ASSOCIATION.

The annual business meeting of the Maine Dairymen's Association was opened at 1.45 by the president, H. G. Beyer, Jr., who gave the annual address, as follows:

ANNUAL ADDRESS OF THE PRESIDENT.

GENTLEMEN: We are met together in annual convention to review progress for the last year and to plan progress for the next year. All our activities may properly be classified under these two heads.

There are various lines along which improvement can take place. Dairymen can improve, getting better stock; housing their stock in better barns; handling their dairy products in a better manner; in cheapening the cost of feeding their stock, and in installing labor-saving devices. Progress can also be made along the lines of economy of operation and in other labor-saving appliances. All these lines of progress have to do with increasing the profit from dairy farms.

Better stock means that less food will be required to produce one pound of milk. The housing of stock in better barns means that the animals will be maintained more comfortably, and in warm barns, less food will be required. Handling dairy products in a better manner means a cleaner milk and generally an increased price for the commodity. Cheapening the cost of feeds and labor by putting in labor-saving devices makes a direct saving in the cost of operating, and thus tends directly to increase the profit.

I shall not attempt in detail to take up more than two of these items in my address on account of the length of the program today. I do, however, want to speak briefly about the progress made along the lines of better stock and cheaper foods.

Better stock has perhaps taken more of the dairyman's attention than any other question in recent years. The pure bred sire as a means of improving herds is coming to be regarded as the ordinary and proper method for every progressive dairyman to employ toward getting a better milk production from his feed. My experience the last year shows that we are beginning now to get the benefit of the years of teaching that have preceded, and that farmers very generally throughout the state are buying pure bred sires. I also find a greatly increased number of thoroughbred herds. Men are continually writing in to get advice about starting a thoroughbred herd and are looking around to secure good foundation stock, and I feel that our state is now well on its way toward the time when there will be thoroughbred herds in every community, and that we will soon take place among the great thoroughbred breeding states of our country.

I want to recommend to this association that every effort be made by our membership to increase the number of pure bred sires being used in the state, and to increase the number of pure bred herds. It is we organized dairymen who, by our example, should lead the way for our neighbors.

The other problem before the dairymen which I will touch on briefly is the matter of cheap feeding of our cattle. Much has been said about the growing of alfalfa and home-grown grains, and I judge from my personal experience that alfalfa in particular is receiving a very large amount of attention from our Maine dairymen. Now I believe alfalfa is destined to be an important crop with us. Seed breeding will progress and certain strains of alfalfa will be developed which will be of great use to us in Maine; but, at the present time, alfalfa is experimental in our state. There have been only a few successful plots. On my farms we have been in the habit for some years of seeding down a trace of alfalfa in all our grass seedings, three pounds per acre being the amount used. In general I find it somewhat more persistent than red clover, but not much more so; and we have tried five different strains of hardy seed.

I should like to see more attention put on the ensilage and hay crops grown, because I believe that in our climate the farmer can do more toward the economical raising of dairy feed by growing proper ensilage and proper hay than he can by experimenting with alfalfa or home-grown grains. Home-grown grains I certainly do not want to discourage. They all help on the feed bill; but where home-grown grains are raised to the detriment of properly grown ensilage and hay, I think it is apt to mean a loss to the farmer instead of a gain. The ensilage crop is in my judgment the most important cheap feed on a dairy farm and one which in general is rather neglected. In the eight years that we have been raising ensilage we have had ensilage made of the tall horsetooth corn with the kernels just beginning to form on the ear when cut, down to corn which was fully glazed and fit for seed when it was cut into the silo. From this experience I should judge that corn in this climate cut before frost could not be too ripe to suit me. It is generally recommended to cut the corn as it is just beginning to glaze, but in my own experience I would prefer corn fully glazed for ensilage. In the two years that I have been able, on account of the season, thoroughly to ripen my corn, I found that twenty to thirty pounds of the ripe ensilage took the place of forty to fifty pounds of the immature ensilage, and that my grain bill was cut down a third to a quarter. In fact, the results with ripe ensilage were so astonishingly good that I feel like calling especial attention to these facts, for I believe that more progress toward a cheap feed bill may be made by getting fully matured corn than in any other way. This idea of course is not new. We have a bulletin of the Maine Experiment Station telling practically these same results years and years ago; but I simply mention it at this time because it is a line of progress which is not now prominently before our dairymen's minds through this state, and everyone should first of all insure a crop of ripe ensilage.

The next in importance is the hay crop. The hay crop will respond so bountifully to a little care that frequently the yield may be doubled by the application of a little top dressing of manure or chemicals. Not only can the quantity be doubled, but the quality may be greatly improved, and I would recommend that a little constant care of the best areas of hay fields in our state would mean a great increase in production and a great blessing to our dairymen.

In closing I wish particularly to mention the obligation which we as dairymen owe to those connected with organized agriculture in this state: To the University of Maine and to the Department of Agriculture in Augusta. Every dairyman in the state is under direct obligation, first, to the Department of Agriculture which these last two years has been watchful of our interest; and, as President of this organization, I wish to thank Commissioner John A. Roberts and our Dairy Instructor, Mr. Frank S. Adams for their constant and unflagging zeal in their work for the improvement of dairying and agriculture in general.

I also wish to say a word in connection with our live stock sanitary department. I was one of those who were opposed to the appointment of Dr. Joly, of Waterville, for this position at the last Legislature. There is no office more important to the dairymen of the state than that of live stock sanitary commissioner. The property interests of every dairyman are practically in his hands. He has power to kill or quarantine any diseased animals, and dairy animals can be shipped into the state only by permission from him. Having opposed Dr. Joly at his appointment as vigorously as I could, I wish now to do him a duty which I owe him, and that is to say that I have watched his entire administration and have had considerable personal contact with him, and feel that his administration has been the best that I have ever seen in this state.

He has formulated very strict rules in regard to the shipment of livestock, and rules which, until recently, have been rather irksome for me to follow. I want to say, however, that since the outbreak of the hoof and mouth disease in our neighboring states, I have come to respect the rules of our Sanitary Department, and I feel that my herd is far safer under our strict system than it would be in any other state in this Union. The foot and mouth disease has not gained a hold here so far as I know, and if it should, I believe the close personal contact which our Sanitary Department has with the veterinaries all over the state would enable them promptly to stamp out the disease before it got a firm foothold within our state.

Our thanks are also due to the University of Maine and to its active Dean, Dr. Leon S. Merrill, at the head of that corps of workers, which has done so much for us all, and which has furnished energy and help for all our meetings.

Now I come to a recommendation rather delicate in its nature, but which I trust this meeting will receive in the spirit I intend it: Fortunately the University of Maine, one of our great allies in our agricultural work, is out of politics; but one other ally, the Department of Agriculture, is not. Our state government has gone Democratic, which means an almost sure change in the administration there. I believe that we, as organized dairymen in the state, should take some action which would show the Legislature of our state what we want. I do not believe that this organization should make a partisan recommendation at this time. As a matter of fact, it would be unwise to do so, because the two parties are rather evenly balanced. I do believe that, as organized dairymen, we have a right and a duty to make a recommendation to the Legislature at this time. To be specific, I would like our association to recommend that the Legislature select the candidate for Commissioner of Agriculture from those who have in the past constantly maintained a sympathetic and helpful attitude toward organized agriculture. We would be organized to small purpose if we could not properly make a recommendation of our needs to the coming legislature, and I hope that you dairymen will take this part of my message to heart and take such action as you may deem fit. We have the right and the duty to watch over the dairy interests of the state.

REPORT OF THE SECRETARY.

To the Members of the Maine Dairymen's Association:

A meeting of the Executive Committee was held at the office of the Commissioner of Agriculture, Augusta, January 29, 1914, with all members present. A joint session was held with the Executive Committee of the Maine Seed Improvement Association and the following action was taken:

Voted to hold the annual meeting and exhibition of the two associations at the same time and place.

Voted to accept the invitation of the Bangor Chamber of Commerce to hold the annual meeting in Bangor, providing satisfactory arrangements can be made.

Voted to hold the meeting beginning Tuesday evening, December 8, 1914, and continue through December 9th, 10th and 11th.

The Executive Committee of the Maine Dairymen's Association then went into executive session by itself, in conference with Mr. Frank S. Adams, State Dairy Instructor.

Voted that the Secretary submit plans for premiums and programs to members of the Executive Committee and to Mr. Adams for suggestions.

The Secretary and State Dairy Instructor Adams were empowered to act for the Executive Committee in making further arrangements.

Voted: That the score cards issued by the Association for scoring milk and cream be adhered to the present year.

Two conferences were later held between the Secretary and Mr. Adams, State Dairy Instructor, and all the arrangements for holding the exhibition were completed. Several new premiums were added to the list, and others increased in amount.

The amount received from membership fees was $102.00. This amount, on account of the death of the Treasurer, remains in the secretary's hands and will be paid to the treasurer-elect.

Special committees were appointed at the last session as follows:

Committee on breeding experiments.

Committee to secure an appropriation for new barns at the University.

The Maine Dairymen's Association has repeatedly indorsed and given its support to the passage of the Smith-Lever Agricultural Extension Act, and the Secretary is pleased to report that Congress has passed this measure. The provisions of the Act entitle Maine to a permanent fund of $10,000 annually for the support of Agricultural Extension Work, and additional amounts as follows:

For the year 1915-16, an addition to the $10,000 already specified of $4,389.00.

For each year thereafter for seven succeeding years an appropriation amounting to $3,658.00 in excess of the preceding year's appropriation.

The money available, therefore, from the Federal appropriation for the year 1914-15 is $10,000. The amount to which the

State is entitled for the year 1915-16 is $14,389; for the year 1916-17, $18,047, and for the succeeding years to and including 1922-23 this amount is increased annually by the sum of $3,658. It is necessary, however, in order to take advantage of the Federal appropriation in excess of the first $10,000, that the state shall appropriate for the support of Agricultural Extension Work in connection with the Smith-Lever Bill, an amount equal to the Federal appropriation.

The Secretary takes pleasure in reporting that the relations of the association to the College of Agriculture and the Department of Agriculture during the past year were everything to be desired in the way of helpful and cordial coöperation.

Respectfully submitted,

LEON S. MERRILL,

Secretary.

Voted, that the report of the secretary be accepted.

Dr. Merrill reported that a check had been received from Miss Alden for $181.02, the amount of the funds of the association in her possession, which he held subject to the election of a new treasurer. Also that he had eighty-two dollars and some cents in his possession which would be turned over to the incoming treasurer.

A report of the delegates to the Maine Federation of Agricultural Associations was called for.

MR. POPE: Mr. President, I think there is really no formal report to be made of that meeting. I understand there was a stenographic report taken, but no copies were given to the delegates. There were several resolutions adopted at that time and practically all were referred to the federation for further action. I think Dean Merrill can tell us what was accomplished at the meeting.

DR. MERRILL: The most of you who were at the federation meeting will remember that the afternoon was given over to the dedication of a tablet in memory of Mr. Gilbert. That limited the business meeting to the evening session. It was a long session and there were a great many reports, but the federation did not arrive at any definite conclusion on the matters introduced and voted to leave the whole matter in the hands of the executive committee. I think all the matters brought before the committee were discussed in full so that the committee had the opinion of the delegates to work upon. Since then the executive committee has had several meetings and at the next annual meeting a full report will be made. We had a stenographic copy of the proceedings but it covered 60 pages of typewritten matter and we had no funds for printing same. I hope we will find some means for having at least a typewritten copy placed in the hands of all the members of the federation, and there are nineteen organizations represented. I think Mr. Pope has raised a point here, although he did not do it directly, with respect to the copies of the record being placed in the hands of the delegates which should receive consideration. I think the members of the Maine Dairymen's Association and the Maine Seed Improvement Association would have greater interest if they could have placed before them a complete stenographic report of the proceedings of the federation. On the other hand, the delegates from the different associations ought to take rather complete notes of the proceedings so that the associations making up this federation might be kept in very close contact with it. If I should lay on the table the typewritten report covering 60 pages, not very many of you would read it. It seems to me it is the duty of the delegates to reduce to very definite form the notes taken by them and to carry back to their association as full and complete a report as possible.

The report of the delegates to the Maine Federation of Agricultural Associations was accepted and approved.

Committees were appointed as follows: Committee on resolutions, L. C. Holston, L. E. McIntire, A. E. Hodges; committee to secure new members, F. S. Adams, W. G. Hunton, R. W. Redman; committee on nominations, Chas. Millett, Benjamin Tucker, W. G. Hunton.

Mr. Redman: In view of the fact that the market milk specialist sent here from the Department of Agriculture has presented certain objections to the method of awarding prizes, the method of handling the exhibit, etc., I would ask that that gentleman suggest methods for future meetings and that a committee be appointed to confer with him before he goes. If we are not doing the things that we ought, we should get wise. As he is to leave this evening, immediate action is necessary.

Mr. Beyer: It seems to me that is a very wise thing to do and it suggests the idea of a standing committee whose duty it shall be to give special attention to the receiving and handling of dairy exhibits. A motion would be in order to that effect.

On motion of Dr. Woods, it was voted that a committee of three be appointed by the chair, which shall be a standing committee, to give especial attention to the matter of receiving and handling dairy exhibits; and that the Dairy Instructor, by virtue of his position, shall always be a member of this committee. The following gentlemen were appointed as this committee: F. S. Adams, L. E. McIntire, Elmer E. Harris.

An invitation was presented by the president, from the Portland Board of Trade, for the next annual meeting to be held at that place. It was voted that this invitation be referred to the executive committee.

REPORT OF VISITORS TO THE COLLEGE OF AGRICULTURE.

Your representatives to the College of Agriculture met and conferred with representatives from allied organizations in the state during Farmers' Week at the College.

We decided to form ourselves into a committee and report our joint findings and submit recommendations as a committee to our respective organizations.

The increased and increasing number of students in the college has necessitated several changes even in the recently erected agricultural building, Winslow Hall, in that partitions have had to be removed to increase size of laboratories and recitation rooms. A thoroughly equipped bacteriological laboratory has been thus installed and a seed display room has been begun and if the present plans are carried out, this room will be an education in itself in seed selection and testing.

We deem these improvements to be wise and in our humble judgment a good start to make this State College an example of and a place where authoritative knowledge on agricultural subjects may be looked for and found.

Along this line of thoroughness, it would seem that our legislators, if not already acquainted, should be made acquainted with the desirability and need for continuing this work in every line of agriculture.

To this end, we make the following recommendations:

First, That modern barns be built, the present structures being far from what present needs and modern requirements demand for approved housing of working and breeding animals and for certified dairy products. A stock judging pavilion should be built in connection therewith.

Second, That a new dairy building be erected, as the present plant is entirely inadequate to furnish students with the required amount of instruction as laid down in the curriculum. This will have to be done to maintain the present standard of the college.

Third, That greenhouses and laboratories, connected therewith, be constructed for proper instruction and practice in floriculture, horticulture, soil, bacteriology, forestry, spraying, and grafting. No argument is needed to convince one of the needs along this line after a single visit to the present structure.

Fourth, That a veterinary operating room is needed and it would seem to the committee that the present stock pavilion might be advantageously turned into such.

Fifth, That sufficient land should be used on the present property of the University or more land be procured in order that the sheep and hogs might have sufficient pasture, as it is a conceded fact that continual housing or confinement is an impracticable method of economical production of such animals.

Sixth, That the associations we represent pass resolutions adopting these recommendations and do all in their power to aid in obtaining legislation to the end that the Agricultural College may become what it should be, a place of highest authority for public information on all agricultural subjects.

Respectfully submitted,

C. S. McIntire,
L. E. McIntire,
L. G. Holston,
Committee.

Voted, that the report of the visiting members of the College of Agriculture be received and adopted.

Mr. McIntire stated that the three associations sending visiting members to the college had agreed to report as one committee, as they thought it was much better to work together and agree on certain things than for each one to send in a report, perhaps recommending something different.

REPORT OF COMMITTEE ON BREEDING EXPERIMENTS.

I. History.

The outstanding event in connection with the work of the committee during the past year which we have to record is the lamented death of our chairman, Mr. Rutillus Alden. To every member of the Maine Dairymen's Association the death of Mr. Alden means much. It removes from our midst one of our founders and a man who had done more to advance the dairy interest of the state than perhaps any other one individual. But to the members of this committee the loss of Mr. Alden means perhaps more than to anyone else in the association. As a member of the Council of the Maine Agricultural Experiment Station, Mr. Alden was the first one, a number of years ago, to advance the idea that the state should provide funds whereby the Station could undertake comprehensive investigations on the breeding of dairy animals. Mr. Alden never relinquished this idea until it was accomplished. Only those of us who were close to Mr. Alden in this work can know how near to his heart was this idea of the necessity for scientific investigations in cattle breeding. Without special scientific training himself, he saw with a vision as clear and a purpose as determined as that of the world's greatest scientific men, that hope of real and permanent progress in agriculture lay in the prosecution of fundamental scientific research on the principles which underlie the practice of the art. We mourn his loss.

II. Progress.

Since the last meeting of the association work on the investigations which were outlined in the last report of your committee has been prosecuted energetically and we are able to report definite progress in several lines at this time. The preliminary phase which occupied our time during the first year after the appropriation was made has now largely been completed and we are beginning to get to the point in the investigations where every definite result gains points directly towards the final goal.

In reporting the progress of the work we shall consider separately each of the different lines being carried forward.

I. THE STUDY AND ANALYSIS OF MILK RECORDS.

A large amount of work has been done along this line during the past year. The most notable achievement in this direction has been the completion of the studies directed towards finding out the law which relates milk flow to age in dairy cattle.

It is a fact well known to all dairymen that as a cow grows older, up to full maturity, her milk yield increases at each lactation, under normal circumstances. Furthermore, it is well known that after a cow passes a certain age her milk flow begins to fall off with further increase in age. Before any accurate study can be made of the inheritance of milk production, upon which any scheme of breeding for improved milk production must be based, it is necessary to have accurate corrections for the effect of age upon milk flow so that cows of different ages may be compared with each other. The work on this problem, which has been very laborious, is now being brought to a close and tables are being prepared by which it will be possible, knowing a heifer's milk record, to read off her probable production as a mature cow. These tables in due time will be published in bulletin form for the different dairy breeds. The work on Holstein-Friesian and Jersey cattle is now practically completed.

An interesting point about this change of milk flow with age is that the increase as the cow grows older after her first lactation is not regular. Instead it follows what is known in mathematics as a logarithmic curve. In other words, the amount of milk produced by a cow in a given unit of time is a logarithmic function of her age. This law may be stated verbally in the following way: Milk flow increases with increasing age but at a constantly diminishing rate (the increase at any given time being inversely proportional to the total amount of flow already attained) until a maximum flow is reached. After the age of maximum flow is passed the flow diminishes with advancing age at an increasing rate. The rate of decrease after the maximum is, on the whole, much slower than the rate of increase preceding the maximum. In general this law applies to the absolute amount of fat produced in a unit of time as well as to the milk.

In connection with the establishment of this law of relation of milk flow to age it has been necessary to work out in the laboratory a new method of dealing with such figures and a paper is now in press having the title "The Fitting of Logarithmic Curves by the Method of Moments."

When the tables spoken of above are completed and published in bulletin form it will be possible for any farmer who keeps a record of the milk production of his heifers at their first lactation to predict, with an average error of rather less than two per cent, what the production of the same cow will be when she is seven years old. Furthermore, it will be possible for a dairyman to give each one of his cows an absolute rating in comparison with advanced registry animals of the same breed at any given age. If he will keep a milk record, he can with the help of these tables say whether or not a particular cow is better or worse, and by what proportion, than the average of advanced registry cows of the same age.

In addition to this work on the relation of milk flow to age a comprehensive study has been made on variation in milk flow and butter fat percentage in Ayrshire cattle. For this purpose we have made use of records kindly furnished us by the Scottish Milk Records Society giving exact data on the milk production of large numbers of pure-bred Ayrshire cows. This study has been completed and is now being written up for publication and will be issued sometime during the coming year.

2. THE STUDY OF INBREEDING IN DAIRY CATTLE.

The work on this line during the last year has consisted in the first place of further extending the theoretical consideration of the problems of inbreeding, in preparation for final analysis of the results of our pedigree studies on the Jersey and Holstein breeds. We have now got the theoretical mathematical foundation laid for these studies and are ready to go ahead with the actual analysis in the two breeds of cattle mentioned. During the year a paper has been published which gives a method of further measuring the degree of inbreeding in a particular case through the medium of relationship coefficients. We have now reached the point in the analysis where it is possible to say in any given pedigree exactly what proportion of the observed inbreeding results from the relationship of the sire and the dam and what proportion results from the relationship from earlier ancestral generations. Some of the results which come from this study are very interesting and at first sight somewhat paradoxical. For example, it has been conclusively proved that an animal may be highly inbred without the sire and the dam being in any way whatsoever related to each other. This means that in such strongly line-bred animals as dairy cattle it may often happen that after making what the breeder supposed to be a distinct outcross the progeny will still be to a very considerable extent inbred.

The work on inbreeding in Jerseys and Holsteins has progressed to the point where the pedigree work is completed. The further analysis of the pedigrees has, however, been held up since last summer owing to lack of clerical help. We hope to be able shortly to take up this work again and push it forward to completion. In connection with this work it is very gratifying to report that the Maine Agricultural Experiment Station received as a gift from the Royal Jersey Agricultural Society during the past year a complete set of the Jersey Island Herd Books from the beginning. This set is almost certainly the only complete set of the Island Herd Books in the State of Maine and one of only a few sets in the United States. This means that any Maine breeder of Jersey cattle can at the Experiment Station look up the complete pedigree, so far as it exists, of any imported Jersey cattle.

3. COÖPERATIVE CATTLE BREEDING RECORD EXPERIMENT.

During the past year there has been put into operation on an extensive scale a coöperative breeding record project in which something over 200 breeders of cattle in Maine and a number in other parts of the world are engaged. The purposes of this experiment are to gain accurate statistical data upon a number of obscure problems in the physiology of breeding and in regard to the determination of sex. It is at this time too early to go in detail into the question of the problems which are to be answered by the results obtained in this coöperative investigation. Some idea of these may be obtained from the blanks used which are reproduced below.

MAINE AGRICULTURAL EXPERIMENT STATION

Orono, Maine.

This Information will Be Held Strictly Confidential.

This blank should be filled out immediately after the service is completed, and mailed in an addressed envelope furnished you, to Raymond Pearl, Experiment Station, Orono, Maine.

SERVICE RECORD.

Date. Hour of service. This record made by

BULL used. Breed.
(Name)
Is the bull registered? If so, give Reg. No.
Owner of bull—Name. Address.
Age of bull. No. of coverings at this service.

COW served. Breed.
(Name)
Is this cow registered? If so, give Reg. No.
Owner of cow—Name. Address.
Age of cow. When did she calve last? (Give month, day and year)
How many times has she been in heat since calving, *including* this heat?

Give the hour (and day) when it was first noticed that the cow was in heat before she was put to the bull this time.

How many hours had the cow been in heat before she was served?

(Do not write in this space).

SERIES. NUMBER.

MAINE AGRICULTURAL EXPERIMENT STATION

Orono, Maine.

This Information will Be Held Strictly Confidential.

One of these blanks should be filled out immediately after each calt is born, even if it is a premature birth (abortion). Mail to Raymond Pearl, Experiment Station, Orono, Maine.

BREEDER'S BIRTH RECORD.

Date of birth. Hour of birth. Record made by

Was the calf male or female?
(Make special note of twin births).
Weight of calf at birth.

Sire of calf. Reg. No.
(Give name and breed)

Dam of calf. Reg. No.
(Give name and breed)

How long was the dam dry before calving?

At what hour (and day) did labor begin?
Has the dam ever aborted?
(If so give particulars).

Note any peculiarity about the birth or the calf which interests you and might interest others, especially abortions and monstrosities.

(Do not write in this space).

Sex entered......................

Duration of gestation days hrs. (20 x)+

SERIES. NUMBER.

At this time we wish to take occasion to thank most heartily the members of this association who have so kindly coöperated in this work. We realize that it is some trouble to the breeder to fill out these blanks and that when he does it, it is without any thought of immediate personal gain, but from the altruistic motive of helping along the general knowledge of the laws of breeding in dairy cattle. We are extremely grateful to those who are helping us and should be very glad to have as many more volunteer coöperators as possible who may care to take part in the work. Details in regard to this plan may be obtained by writing to the Maine Agricultural Experiment Station.

4. THE RELATION OF THE TIME OF SERVICE TO THE SEX RATIO IN CATTLE.

One of the primary purposes for which the coöperative cattle breeding record plan discussed in the preceding section was undertaken was to get comprehensive statistics to show whether any definite effect on the proportion of male and female calves born could be observed when service occurred at different times in the heat period. Earlier work done at the Station some years ago indicated that when service occurred very early in heat there was likely to be born a larger proportion of heifer calves, and when service occurred very late in heat there was likely to be born a larger proportion of bull calves. With a hope of getting a very much larger amount of more precise data on this point, the cattle breeding record plan was inaugurated. The results to date have been very gratifying. The following table shows the sex of the calves on which exact records of time of service have been had up to date.

	Bull calves	Heifer calves	Bulls to 1000 heifers
Service early in heat...	160	243	658
Service in middle of heat	77	69	1116
Service late in heat....	97	52	1865
Totals	334	364	

From this table it is clear that there is a very striking difference in the result according to whether service is early or late in heat. This difference is already well beyond the bounds of probability of accidental occurrence. It is proposed, however, to continue the coöperative breeding record scheme for two or three, or possibly more, years until a sufficiently large number of records have accumulated to make the conclusion beyond doubt.

5. THE RELATION OF BODY CONFORMATION TO MILK AND FAT PRODUCTION IN CATTLE.

During the past year there has been begun an investigation of dairy cattle which has for its purpose to determine the various bodily dimensions of dairy cattle and to see what, if any, correlation there is between the bodily measurements and the productivity of the animal. The whole system of judging dairy cattle is based on the assumption that there is a definite relation between the external conformation and the productivity of the animal. It is hoped by this investigation to give this idea of judging for dairy merit a much more definite and scientific foundation. The plan of the measurements to be taken is indicated by the blanks used which are reproduced in facsimile below.

MEASUREMENTS AND MILK RECORD. **Serial No.**

RECORDER..........................

COW.......................Breed...................Reg. No..................

Owner................................Address..............................

Date of birth of cow........................Date measured....................

Condition of cow when measured..................Age measured.................

When did she calve last?.................When was she bred?...................

Head: 1. Length..................in.; 2. Breadth between eyes............in.;
3. Breadth between horns..........in.; 4. Muzzle width............in.

BODY: 5. Weight..........lbs.; 6. Length..........in.; 7. Height in withers..in.
8. Girth just behind shoulders........in.; 9. Girth at last rib..........in.;
10. Breadth between fore legs...........in.; 11. Angle at withers..........in.
12. Temperatire..................Taken......................

RUMP: 13. Length from hip to pin bones............in.; 14. Hip breadth.......in.;
15. Pin breadth................in.; 16. Vertical height, pin to hip..........

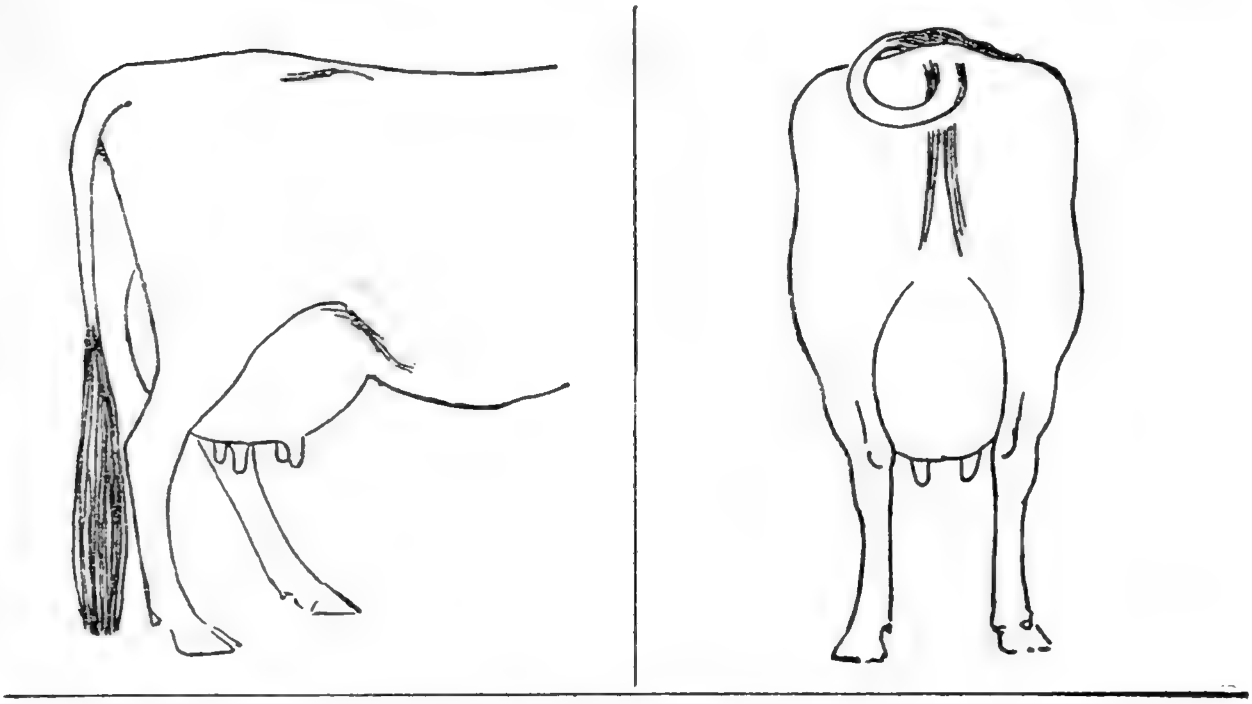
UDDER: 17. No. of normal teats.........; 18. No. of rudimentary teats.........
19. No. of milk wells............

MILK RECORD: 20. Lbs. of milk........... 21. Lbs. of fat..................
22. Mean per cent. fat................ 23. Age at record................
24. Date when record begun........... 25. Weeks in milk................

REDUCTIONS	29..........	33..........	37..........	41..........	45..........
26............	30..........	34..........	38..........	42..........	46..........
27............	31..........	35..........	39..........	43..........	47..........
28............	32..........	36..........	40..........	44..........	48..........

REMARKS:

Return this blank, NOT FOLDED, to Raymond Pearl, as soon as completed.



OUTLINE (a) Escutcheon; (b) Extent of udder, on both rear and side views.
NOTES ON ESCUTCHEON AND UDDER.

It is hoped that we may have the coöperation of various breeders of dairy cattle in the state in this work. Plans are under way by which it is hoped that it will be possible to obtain these measurements on every animal undergoing test for advanced registry in this state. If we can do this, we shall be able in the course of a few years to accumulate a vastly more complete and accurate body of knowledge than anything we now possess as to the points of merit in judging the dairy work of an animal from external appearance.

6. THE INHERITANCE OF MILK AND BUTTER-FAT PRODUCING ABILITY.

Work on this phase of the problem is being conducted along the two general lines mentioned in our last report. The analysis of the existing records for the advanced registry in the Holstein and Jersey breeds is going forward as rapidly as possible, considering the enormous amount of labor involved in this work. The breeding experiments with the University of Maine herd are now progressing in a satisfactory way. Already a number of the experimentally bred calves have been born and are growing nicely. By the end of another year we shall have a considerable number of animals in the cross-breeding experiments from which may be tested, by Mendelian methods, the way in which milk and butter fat production are inherited when a high producing and a low producing breed are crossed together. Such experiments, as we have pointed out in previous reports, are absolutely essential to gain a complete understanding of the process.

III. The Future.

Your committee wishes again to point out the need for continued official support for this work on the part of the Maine Dairymen's Association. The breeding experiments with dairy cattle are bound in the nature of the case to take a long time for completion. Quick results cannot be had. The work at the present time is making good progress. As we pointed out in our last report, if this work is to continue to be successful and valuable to the live-stock breeders of the state it is essential that it be adequately supported. The most immediate and pressing need for the work will be the provision of adequate barn space. Unless, at the coming session of the legislature, the University of Maine gets an appropriation for a new barn, it will mean that the breeding experiments must practically come to a standstill and remain there until such a time as barns are provided. In view of the necessarily time-consuming nature of any breeding experiments with cattle it seems of the utmost importance that no avoidable hindrance which would prolong this time should be put in their way.

Respectfully submitted,

W. G. Hunton,
F. S. Adams,
Raymond Pearl.

Voted, That this report be accepted and the committee continued. On account of the death of Mr. Alden, a member of this committee, it was voted that when the association elect a member of the Experiment Station Council the person elected shall also be a member of the committee.

The following officers were elected for the ensuing year: President, H. G. Beyer, Jr., Portland; vice president, H. M. Tucker, Canton; secretary, L. S. Merrill, Orono; treasurer, Chas. R. Millett, West Minot; trustee, E. E. Harris, Skowhegan; member of Experiment Station Council, F. S. Adams, Bowdoinham; visiting member to University of Maine, L. C. Holston, Cornish.

Voted, that the action of yesterday in relation to the standing committee for receiving and handling dairy products be reconsidered, and that the motion be amended by adding to it that this committee shall act under the advice of the executive committee and that the executive committee's advice shall be final and binding upon them, and the motion be passed in this form.

Voted, that the same delegates who were appointed last year as representatives to the Maine Federation of Agricultural Associations serve the association in that capacity for the coming year, and that this association pay its proportional part to have the minutes of the Federation typewritten for the use of the delegates.

REPORT OF COMMITTEE ON RESOLUTIONS.

Resolved, That this association heartily endorses and will give every possible aid to the securing of an appropriation for a new dairy building and dairy barns at the University of Maine, believing that, as set forth in the report of the committee of visitors to the University, such an appropriation is absolutely essential to the proper development of the teaching and experimental work of the University.

Resolved, That this association notes with great satisfaction that the Smith-Lever Bill, providing for the support of extension work in each state, was passed at the last session of Congress, thus providing for a considerable development of extension work in Maine, and that further, this association will, as an association and through its individual members, make every effort in the direction of ensuring that appropriate legislative action is taken in this state so that Maine may secure the maximum federal appropriation under the Smith-Lever Act.

Resolved, That the joint meetings of the Maine Seed Improvement Association and the Maine Dairymen's Association have been a great success and it is the sense of this association that such joint meetings should be continued in the future.

Resolved, That the Maine Dairymen's Association endorses the county demonstration work as carried on under the direction of the College of Agriculture, and that we would strongly urge the desirability of extending this work as much as possible.

Resolved, That it becomes our sad duty to record the death of Hon. Rutillus Alden. Mr. Alden was the promoter of our organization and his interest was evident, by his loyalty in attendance at every meeting and the keen interest he always displayed in all dairy interests. He was our honored president for four years and through personal effort brought our association into prominence and gave it an impetus that has brought Maine dairy products to a high standard of perfection through different channels of endeavor. At the time of his death he held the office of treasurer, which position he had held for twelve years. He also was our representative on the Experiment Station Council.

Mr. Alden was a citizen of sterling qualities, serving his community and state as few men have. His service to us and to organized agriculture is not measured by the number of offices which he has held, but his enthusiasm, his upright character, and his faith in agricultural work, have stimulated all with whom he came in contact to better ideals in agricultural service.

We desire our secretary to express to the family of Mr. Alden sincere and heart-felt regret at the loss of our dear friend and fellow worker.

Resolved, That we owe obligation and thanks to those connected with organized agriculture in the state, to the University of Maine and to the Department of Agriculture.

Resolved, That especial commendatory mention be made by this association of the splendid exhibition of dairy machinery and supplies shown in connection with this meeting. The value of such a showing of the most up-to-date appliances for carrying on the business of dairying can hardly be overestimated. We appreciate the efforts of the dealers in agricultural machinery and supplies to make this exhibit of real value, and express the hope that it may be profitable to them as well as to us.

We desire also to commend especially the splendid exhibits of dairy products,—milk, cream and butter, and the exhibit of seeds, in which many of our leading farmers have coöperated. We believe that these exhibits constitute one of the most important features at our meetings and that every effort should be made to extend these features at future meetings.

Resolved, That as an association we appreciate the splendid hospitality of the City of Bangor and the Bangor Chamber of

Commerce in the manner in which they have entertained this convention; and that we desire to express our thanks in these few words, assuring the people of Bangor that we shall continue to express our appreciation of their hospitality after we have left the city. We look upon Bangor as our city none the less because the majority of us live in other parts of the state. We appreciate the courtesies extended to us by the press and the railroads and the individual courtesies of the people of the city.

Respectfully submitted,
L. C. HOLSTON,
ALBERT E. HODGES,
L. E. MCINTIRE,
Committee.

Voted, that this report be received and the resolutions adopted.

Voted, that the legislative committee who served last year be continued for the ensuing year.

Voted, that our secretary be instructed to extract from the resolutions such as pertain to the action of the legislature, and send to each member of the incoming legislature our resolutions indicating our desires for legislation.

MR. HARRIS: In regard to future meetings and the method of exhibiting milk and cream samples, quite a number came to Mr. Redman, who had charge of these exhibits, and asked why they could not have the scores of their milk and cream, and also when they were going to know about the bacterial count. As we all know, it is impossible to get a bacterial count until 48 hours after the samples are taken. It has been suggested that next year the samples be sent a week before the annual meeting, either to the University of Maine or Turner Center Creamery or some other place where the work could be done, and then reshipped to the place of the meeting. The only objection would be that it would probably cost more, as there would be an extra charge for time spent in doing the work, etc. But it seems to me, and I think the rest of the committee agreed, that a great advantage would be obtained by knowing just what the score is at the time of the meeting. I move that an amendment be made to the resolutions by adding the following:

Resolved, that our executive committee be instructed to make arrangements whereby such portion of the milk and cream exhibit as is necessary for a bacterial count be sent to some place properly equipped with a bacteriological laboratory in time so that the entire exhibit can be scored and the score attached at the time of the meeting; and that we adhere to our present score card for the ensuing year.

This motion was passed.

Mr. Harris: I wish to say a few words in regard to certain requirements that the Boston Board of Trade has set forth, for the producers of dairy products where the product goes into the city of Boston, in relation to barns and dairies. Last spring at one of the special meetings of the Creamerymen's Association the question came up in regard to undesirable producers of dairy products who are patrons of different creameries. There is nothing to prevent a man, for instance, if a certain creamery does not want to take his product because of undesirability, from sending it to some other creamery if he so desires, or making his own product from a barn that perhaps is unsanitary. It seemed to the creamerymen at that time very wise if something could be brought to bear on the Department of Agriculture whereby a sort of clearing house could be established so that an undesirable producer might be listed; that the question of licensing or registering of producers of dairy products, whether creamery patrons or milk producers, would be a good thing. That has not been presented to the Department for the reason that the man at the head of the dairy inspection work was transferred to another field and his work was under the pure food division. In view of the fact that the Boston Board of Health are doing this very work, it seems to me that the dairymen of this state ought to take action along that line; that we should get on the ground first and do something that would be acceptable to the Boston Board of Health. Of course what they would advocate for the health and happiness of the people there is nothing more than we would advocate for our own state or any other place where the product goes. The creamerymen appointed a committee to wait upon the agricultural department and possibly, further, the legislature.

MR. BEYER: That is a very interesting question and one which I imagine our dairymen would want to take into consideration and take wise action upon, whatever it might be. I wish we had had the suggestion a little earlier so that we might have appointed a committee to look over the ground and make some intelligent recommendations. It might be proper to appoint a committee to investigate, or this body may wish to take some action now.

MR. REDMAN: Would it be wise to leave that to the executive committee to act as they saw fit?

MR. BEYER: It might be, if the meeting so desired. It is quite a big question, and I do not know whether the executive committee would want to act on so important a matter without consulting the whole body or not. That is up to you, gentlemen.

H. M. WOODS: It is too much of a proposition to settle off hand here in five minutes. And if we do not leave it to a committee we cannot act as an association again for a year. It is a question of referring it to a committee or letting the matter lie for a year. I would be perfectly willing to vote in favor of a motion to empower either the executive committee or a special committee appointed for that purpose to act for the association.

DR. PEARL: In a matter of this kind it seems to me that the most unwise thing in the world would be hasty action. It seems to me that it would be well to refer the matter to a committee to report at the meeting of the association next year and be prepared at that time to make recommendations. I think a year is not too long a time to consider what we want to do, especially in view of the prevailing trend of legislating goodness into us which some people I am sure look on with doubt. I myself am not inclined to too much in that line. It seems to me it is better to go a little slowly and either appoint a special committee or ask the legislative committee to report with definite recommendations a year from this time.

MR. MCEDWARD: Mr. Harris has just said that something of the kind ought to be done. Something is being done now. The Boston Board of Health has had men down in our section doing this very thing,—that is, refusing to allow certain farmers to sell their cream or milk, or dispose of it in the Boston markets. I am interested in this in a small way. The same farmers came to us and wanted us to receive their products.

We had to refuse them. We do not want it in the first place, and in the second place it would only encourage them in their methods. I feel that something ought to be done at once. If another creamery will take the product of these farmers who are delinquent, there will be nothing done to better conditions, but if a man is made to clean up and put more light in his tieup it will be better all around. I move that the executive committee have control of this and would add the name of Mr. Harris to the committee.

MR. BEYER: The motion is now made that the executive committee of the Maine Dairymen's Association, with the addition of Mr. E. E. Harris, serve as a committee with power to act for this association in regard to the listing of undesirable producers of milk in this state.

MR. HARRIS: It seems to me that it does not cover what would be required. I was talking with Mr. Ryder of the Turner Center Creamery who went out with the man whom the Boston Board of Health has sent into the state. The expenses of this man were some over $8.00 a day, and that was paid, as I understand it, by the State Department of Agriculture of Massachusetts. They go into the barn and use the government score card. The score, however, is very moderate. I think a score of 45 will pass, so that hardly anyone would be shut out from having the right to sell cream unless there was some undesirable feature that he might overcome, in regard to manure, or light in the tieup or something of that sort. It seems to me that in connection with that barn inspection there might be something that we could do, for our own good, and which would at the same time be acceptable to the Boston Board of Health. Mr. Ryder said that a certain patron was shut out and he said he would not fix up but would go to another creamery, and he did. We do not want to be driven into this by the Boston Board of Health.

MR. HOLSTON: I think we should go pretty slow on this proposition because a great number of the dairymen in this state and in all other states have not the equipment that they would like to have, due possibly to the prices they are getting for their products. They have a dairy and would like to make that pay as a dairy, not as a breeding establishment, but it is impossible. They have got to get their profit by breeding;

therefore they cannot build up their dairies until they get better prices, because if they do they are going to do it with the prices they get for breeding. You have got to go slow or you will drive the producer of milk and cream out of the business.

Mr. McEdward: I do not exactly agree with the gentleman who just spoke. It is not very expensive to buy two or three windows and a couple of barrels of lime for whitewash, and to sweep down cobwebs. We do not expect to have cement walks or cement buildings, but just ordinary cleanliness, and this should be looked after. It is not very much expense to do the things they require.

Dr. Pearl: I would like to inquire whether the things that are contemplated are not already provided for under our pure food law. In substance it says that the production, or transportation, or exposure for sale of any food product whatever is subject to inspection. Is there any need for another inspection or additional legislation beyond what we have now? What I mean to say is, How can the Boston Board of Health force us into anything beyond what is already required in our pure food law? If they are going to shut out the product anyway how is any legislation that we might enact going to change that?

Mr. Harris: As I understand it their inspection covers barn inspection. We have an inspection of creameries and we have to live up to the requirements, but there is no inspection of barns and dairy houses, no requirements that the dairymen have to live up to. For instance, we will say that there is a barn in our section that has three windows, with lights of glass 7 by 9, in a tieup 24 feet long in which there are 12 cows. The hay and straw are hanging down through the fence rails overhead and the gutter is full of slush. Is that a fit place to make milk? We do not accept that kind of goods but perhaps some other creamery may. Perhaps the man may make butter; in fact I know of a man who is making butter under practically those conditions and he sells it to people and they call it good. Now is it right to let those things exist?

Mr. Holston: I would like to know who is going to pay for these charges. Where is the money coming from?

Mr. Woods: As near as I can make out, what the creameries want is some inspection of the dairies from which goods are being sold to the creameries. It looks to me like a matter that the creamerymen are more interested in than this association.

Mr. Fuller: I don't know as I want to take one side or the other but I will give you a little description of my barn, that I used to have. We had a tieup 50 feet long and 11 feet wide. It was not much better than the one which Mr. Harris spoke of. A few boards were thrown over some timbers overhead. It was not satisfactory and we had no money to improve it with. We had two windows for each end and there was a chamber out on the backside where the manure was thrown out through the window. We had electric lights so that we could work fairly comfortably although it was very dark and we kept our cows clean. At that time I was making butter and bringing it to the State Dairy Conference and I got a higher score than I ever got in my new barn with plenty of light.

Mr. ———: I used to produce milk in those dark halls, and now I produce it in a place reasonably light and which can be kept decently clean; but I want you to understand that no improvements would ever have been made on my farm towards making better milk and a better place to keep my cows out of the income of those cows through the selling of dairy products. It looks to me that the laborer ought to be worthy of his hire. It looks as though when a farmer puts in his time and money, and does his end of it, he should have remuneration for it so there would be a little profit above the expense of keeping his cows. There is a big leak somewhere. When the business will not warrant building a barn and maintaining a place to keep stock that will be sanitary, somebody ought to pay a little more for the product.

Mr. Adams: I was very glad to hear from the gentleman. The Boston Chamber of Commerce are holding meetings in Maine with the end in view of finding out the cost of production from the farmer's standpoint, and they are going to investigate the whole milk situation. In going around over the state the evidence they have obtained from the actual producers would indicate that the producers of milk are not making any money. If they did not do some other branch of farming in connection with the milk production, their income would not be sufficient to maintain them. It seems to me that the dairymen are not getting enough for their product.

I have been thinking of this more or less for the last two weeks because I had a letter from the Master of the State Grange saying that he was going to have a committee on the cost of producing milk from the producer's standpoint and that I was chairman of the committee. I have an idea what I am going to say and I would like to have some backing from the Maine Dairymen's Association. With that end in view I would like to have a committee appointed from the association so that I could have a little conference with them before I go home and find out how this matter shall be brought before the State Grange.

Mr. Beyer: There is a motion before the house that the executive committee of the Dairymen's Association, with Mr. Harris, form a committee with full power to act for this association in connection with the situation brought up by the Boston Board of Health in the listing of undesirable producers of milk in this state.

Mr. Woods: I would like to make a motion to amend that motion so that instead of giving the committee full powers to act, they shall report at the next meeting of the Maine Dairymen's Association.

Mr. Harris: It seems to me that it would be unnecessary to have such a committtee if this was the case. They could not possibly accomplish anything for a year.

Mr. McEdward: I feel that even if we make a mistake we should do something and do it now. The matter could be circulated around so that most of the dairymen who are interested would know about it. I think that nothing definite should be done in regard to legislation. There is no need of that. We cannot legislate a man to be clean. A gentleman spoke about there not being any money in the business. I will say that I have been way through the west and I find the State of Maine pays more per pound of butter fat and gallon of milk than any other state in the country. The price is now about $2.00 per hundred. It is up to the farmers to keep 12,000 pound cows instead of 4,000 or 5,000. The great trouble is that they do not keep the right kind of cows.

Mr. Woods: The first people that would howl if every dairyman sold off every cow that was not making a profit would be the creamerymen. About half the cows would be sold.

MR. HODGES: I do not want it to be understood that I think the creameryman is not paying all he ought to. But I will say that I have a herd of cows producing 300 pounds of butter fat and there is not a cent of profit. I am not looking for profit from my dairy. When you are breeding there is a small profit. When a man runs a dairy and buys his cows, if he has almost 400 pound cows he cannot buy many luxuries out of the dairy at present prices.

The motion to amend the original motion was put and was lost.

MR. HARRIS: Before I mentioned this matter I had some doubts in my mind whether I ought to speak of it from the fact that some here might know that I was a creameryman, but I am glad it has been discussed. There is not a man here, I dare say, that such a measure would affect in the least. Now then, if the dairymen here are all right and their barns are all right, and the product all right, perhaps they are putting that product right in with somebody's product that is not all right. Is it not due to yourselves that some action be taken in a conservative way that we may build up our dairy products? We all know that the State of Maine cream and butter fat are paid for at a higher price than is paid in any other state. Whether it is enough so that the farmer will be satisfied,—that remains with the farmer.

MR. WOODS: I would like to know a little more definitely just what action the creamerymen want taken.

MR. BEYER: The undesirable producers of milk would be listed and then the Boston Board of Health would exclude their product from the Massachusetts market. Mr. Harris' motion, as I understand it, involves the appointment of a committee to take action for our association in regard to this, with full power to act for the association. The Chair will state its opinion that any action which our association will take will be purely in an advisory capacity to the legislature and the Boston Board of Health or any other body with which it might come in contact. Whatever action the committee could take would be advisory and would have the authority of our association behind it.

MR. WOODS: If that is the meaning of the motion I withdraw any objection.

MR. BEYER: As the Chair understands it, the only possible objection that the farmers might have, from their standpoint, is that this association might be committed to approval of the attitude of the Board of Health in Massachusetts. I think that is a very likely and proper objection, but that would not necessarily apply. Such a committee could investigate, could confer and advise, without having anything to do with the action which the Massachusetts Board of Health is taking.

MR. MCEDWARD: I have been a member of this association ever since it was organized and I have found in my travels over the State of Maine that the men who attend these meetings have no fear of the Board of Health. The men who never attend these meetings, and never get these reports, are the ones we have the trouble with.

The question was called for and it was voted, that the executive committee of the Maine Dairymen's Association, with Mr. Harris, form a committee with full power to act for this association in connection with the situation brought up by the Boston Board of Health in the listing of undesirable producers of milk in this state.

PRIZE ESSAYS.

The same prizes were offered by the Maine Dairymen's Association as in 1913, for the three best essays by students in the agricultural courses in secondary schools in the state, upon subjects selected by the association, namely,—First, gold watch; second, silver watch; third, fountain pen.

These prizes were won by Edward C. Whitman of the Greeley Institute, Cumberland Center, Herbert L. Seekins of Hartland Academy and Hervey S. Bean of the Maine Wesleyan Seminary, Kent's Hill.

The presentation was made by Dr. L. S. Merrill, Secretary of the Maine Dairymen's Association, in a few well chosen remarks.

The essays will be found in the following pages.

COST OF RAISING THE DAIRY CALF TO ONE YEAR OLD.

By Edward C. Whitman, Cumberland Center.

(Prize Essay)

The cost of raising the dairy calf to one year old has become a much debated question among the successful dairymen of today. During this early period of the calf's life it often appears that there is very little remuneration for the labor and feeds expended on a calf which is of course at this time an unknown quantity. Even if the calf is the offspring of a pure bred sire and dam—and today the slogan of the successful breeder is to breed only pure bred animals—the calf's ability is somewhat obscure.

As the subject to be discussed here is only the cost of raising the dairy calf to one year old, the question of breeding pure bred animals will not be touched upon. We will all agree that there will be some variation in this cost under different conditions; but, as the following results were obtained from an average calf, and under the average farm conditions, we hope that this essay will convey some helpful ideas to you.

The calf in question was born October 1, 1911, and was fed and cared for in the following manner:

The calf was allowed to suckle its dam for two days, and then was removed. It was offered milk at the next regular feeding, but, refusing to drink, it was not forced. At the next feeding period, however, the calf was hungry enough to be readily taught to drink. In nature the calf gets its milk often, but in small quantities, and always at blood temperature (95 to 100 degrees). In this respect nature was imitated, as far as possible. The milk was weighed for each feeding. At first the calf was fed ten pounds per day, divided into three meals,—four pounds in the morning, two pounds at noon, and four pounds at night This quantity was increased gradually to twelve pounds per day. After two weeks the milk was fed twice daily. Since the calf is a very greedy animal, there is often a great temptation to give it more milk than it can properly handle, thus causing scours. Over-feeding is undoubtedly one of the main reasons why so many farmers fail in raising good calves on skimmed milk.

The milk was always fed warm and sweet. Had it been impossible to have the milk sweet all the time, it would have been fed sour every meal. It is possible to raise a good calf on sour milk, but it is not possible to raise a good calf by feeding sweet milk one meal and sour the next.

Since the advent of creameries, the raising of calves on skimmed milk has been a subject of vital importance to every creamery patron, and one of growing importance to every private dairyman. When calves six months old are worth from $25 to $30 a head, and when the profits of a good dairy cow are so greatly enhanced by raising the calf on skimmed milk, it is vastly important that we know how, first, to raise a No. 1 calf and second, how to accomplish this result through the medium of skimmed milk.

When the calf was eight days old, the feeding of skimmed milk was begun. The stomach of a calf is delicate and sensitive, and any change of feed should be made gradually. The change to skimmed milk was made gradually, substituting one pound of skimmed milk for one pound of whole milk, until at the end of the twentieth day a straight skimmed milk ration was fed. Clean, sweet skimmed milk was always fed, and to each allowance a teaspoonful of blood meal was added as a preventive of scours. The skimmed milk was gradually increased until the calf was getting twenty pounds a day. This was the maximum amount fed. Skimmed milk may be fed to calves as long as there is an abundance of it. Good cows have been produced from calves that had skimmed milk only four or five weeks of their life, while equally good cows have been produced from calves that had skimmed milk for ten or twelve months. There is no doubt that prolonged feeding of skimmed milk will produce a coarse, thick skin, which will disappear with the leaving off of this feed.

When two weeks old the calf was fed its first grain. At first a little was put into its mouth after drinking its milk. When the calf found out how it tasted, it was eager for more. But as a calf at this age eats a very small amount of grain, each feed was not weighed. So it was not fed more than it would eat with relish. At the end of the third month, 38 lbs. of grain had been consumed. The following grain rations were fed:

Grain ration No. 1.

Bran, 4 parts,
Corn meal, 1 part,
Linseed oil meal, 1 part.

Grain ration No. 2.

Bran, 2 parts,
Linseed oil meal, 1 part,
Ground oats, 1 part.

These rations were fed in equal parts; ration No. 1 was fed at night, and ration No. 2 was fed in the morning.

The calf began to nibble at hay about the same time that it commenced to eat grain. After a few days the calf consumed nearly a pound a day. This quantity increased as the calf grew older. Nothing but clean, bright clover hay was fed.

The calf was early given a yard out of doors, in which to exercise and develop itself. The claim is made that calves given this privilege when young have more vigor than those always kept in close confinement. Later in the summer the calf was turned out to pasture with the rest of the herd, in order for it to become accustomed to grass feeding, and to gain strength and vigor. To summarize: The calf was fed warm, sweet milk out of clean buckets, had plenty of grain and bright hay, access to fresh, clean water and salt, plenty of sunlight, shelter and bedding in cold weather, shade in summer and regularity and kindness in feeding and care. That the calt responded to this treatment may be seen by studying the following records and tables.

For convenience the year was divided into four periods of three months each.

Table No. 1.

	At birth	3rd month	6th month	9th month	12th month
Weight	65	175	300	430	515
Grain		110	125	130	85
Average daily gain....		1.22	1.38	1.44	.94

Table No. 1 gives the weight at birth, and the weight at the end of the third, sixth, ninth and twelfth months. An interesting fact shown by the tables is that the calf made the greatest gain during the ninth month. This gain may be attributed to the fact that the grain ration was increased each day during this month.

COST OF FEED FOR THREE MONTHS' PERIOD.

Table No. 2.

1-3 month	3-6 month	6-9 month	9-12 month
$7.02	$7.70	$8.55	$10.50

The preceding table shows the cost of feed through each of the three month periods. It will be noticed that the cost of feed increased in each successive period. This table shows that 20.8% of the cost of feed for the year came in the first three months; 22.8% from the third to the sixth month; 25.3% from the sixth to the ninth month; and 31.1% from the ninth to the time the calf was one year old.

COST OF FEED PER CWT. GAIN.

Table No. 3.

1-3 month	3-6 month	6-9 month	9-12 month
$6.38	$6.16	$6.57	$12.35

From table No. 3 the cost per cwt. of gain can be seen to increase as the date of birth recedes. The average cost per cwt. of gain for one year was $7.86.

FEED CONSUMED IN POUNDS, AND COST.

Table No. 4.

	Whole milk	Skimmed milk	Grain No. 1	Ration No. 2	Hay	Cost
12 months	70	4250	244.5	244.5	2155.5	$33.77

In summing up the above results: The calf consumed during the twelve months 70 lbs. of whole milk, 4250 lbs. of skimmed milk, 489 lbs. of grain and 2155.5 lbs. of clover hay, the total cost of which was $33.77.

The prices of feeds on which these calculations were based are as follows:

Whole milk	4c	per qt.
Skimmed milk	25c	per cwt.
Bright clover hay..............	$13	per ton
Bran	$1.50	per cwt.
Corn meal	$1.75	per cwt.
Linseed oil meal	$1.80	per cwt.
Ground oats	$1.50	per cwt.

The feeds grown on the farm as well as those bought were sold to the calf at market prices. If every dairyman charged all the grains he raised to the account of his stock in this way, he would see the advantage in raising as large a proportion as possible of the grains he feeds. In doing this he would be keeping the money at home instead of enriching the grain dealers and transportation companies.

As near as I can find out, after reading several articles and different records, this calf did just about what is expected of the average calf under the average farm conditions. The calf made a gain of 1.2 lbs. to 1.4 lbs. a day from the time it was three months old up to the time it was twelve months old, and it made these gains on the average amount of feed. A noticeable fact shown by the table is that the cost of feeding per cwt. of gain for the last three months was about twice the cost of feeding per cwt. of gain for the first three months.

The cost of raising the calf was approximately what is reckoned as the cost of raising the dairy calf to one year old under the average farm conditions. In this case the cost, not including the labor, amounted to $33.77.

BUILDING UP THE DAIRY HERD.

By HERBERT L. SEEKINS, Hartland.

(Prize Essay)

Dairy farming depends for its success upon a few fundamental conditions. The first is the owner or the one who has direct control of the work. He must have a liking for the business, treat the animals kindly and have good judgment in selection, breeding and care. Second, the herd must be as good as the dairyman can afford to have and must be a breed suited to the work required of them. The third is the markets, which sometimes control the line of dairying and also the location. The most important of these three conditions is the second, the herd, mainly upon which the success of dairying depends.

There are two methods of forming a dairy herd. One is by purchase and the other is by breeding and these two ways may be combined. The first method, by purchase, is not considered a very successful one.

By the former method cows are usually bought when mature and at their prime and are judged by the flow of milk they are giving at the time. The cows are then fed heavily and when they get old and the flow of milk decreases they are fattened and sold for beef. Sometimes a few heifers are raised from some of the best cows to keep up the herd. The bull that is used may be any kind of a scrub so long as the cows are freshened. This way of keeping up a herd takes a large capital, the best of judgment in buying and selling, and one runs the risk of bringing disease into the herd.

The second method, by breeding, takes many years to build up a good herd, but it is considered the safest method and brings about better results.

A man that is just starting in dairying should not be advised to buy pure bred stock. He should buy the best grade stock he can afford. If he wishes to raise the standard of his herd he will purchase a pure bred bull, and in this way he will be steadily working towards a pure bred herd. With any dairyman who intends to improve his herd by breeding, the selection of the bull is of great importance. The bull is considered as half the herd. Every calf that is added to the herd takes half its blood from the bull and it is thought the most important half. This is especially true if the dairyman is keeping grade cows. A dairyman may have a cow that proves a poor dam or fails to breed and the loss will not be great, but if the bull proves to be a poor sire a whole year's work is lost in the improvement of his herd. Considering these points in buying a bull, one should buy the best, or at least, he should buy the best he could possibly afford. When buying a bull one should not only study the animal, but he should study the animal's pedigree and the dairy history of his ancestors. Many dairymen make a great mistake by using immature bulls and disposing of them before they prove themselves worthy as a sire. The chief objection to bulls after they have become three or four years of age is that they are dangerous to handle, but most bulls if they are properly handled may be kept until they are too old for service. The bull should be handled from a calf but should not be plagued in any way. A ring should be put in his nose before he is a year old. He should not be allowed to run loose in a yard or pasture, but should be given regular exercise. If any temper is shown the exercise should be increased. Do not stable the bull in a lonely place but in the same room with the rest of the herd. Always have him hitched by some double hitching device so that he may never by accident find himself loose.

After the herd has been started the owner should become familiar with the characteristics of each one of his cows. One of the best ways is to keep records of each cow. These records should include the history of every member of the herd and a summary of the dairy performances. The latter includes a daily record of the milk yield of every member of the herd and the test for butter fat which should be taken at least twice a month. Some form of the Babcock tester is the simplest and is now within reach of every farmer. To give the owner a more complete knowledge of the work that his different cows are doing, he should keep records of the food consumed by each cow. From these records he can tell accurately the cost of maintenance and the value of the products. When a dairyman finds that some of his cows are not bringing in any profit he should dispose of them at once, for an extra surplus of products on the markets tends to lower the price. It takes a little time to keep these records but it pays, for without them the dairyman cannot tell which of his cows are doing the best work. This point is often shown in buying and selling. Many times a buyer will step into a barn to look over some cows that are for sale. If the man is not keeping records the cows that he has to sell are usually his inferior looking ones, but he has no way of telling how much work these animals are doing and he may lose money by selling them at a low price.

If any dairyman wishes to have pure bred animals, he can get them if he will only make the effort. A beginner in registered stock should not breed and buy stock on its pedigree alone but should make a study of the family merit and dairy record. The pedigree should be supported by uniform excellence in the family. Animals that are bought under these conditions cost more, but it pays. Successful dairying has proved that the greatest profit comes from the best cows, whatever their breed. It is better to pay three hundred dollars for three good cows, than to go out and buy four or five of only average quality. The former animals would also raise the average value of the herd. In buying registered animals one should only deal with men that have a reputation as good breeders whose honesty has been proven. It has often been said that the best part of a pedigree is the name of the breeder.

One of the most important points in selecting animals for the foundation of the herd, is to be sure they have a strong constitution and are vigorous and healthy. Every animal should be tuberculin tested. Breeding and raising the animals to keep up the herd, and not allowing any strange animals to come on the farm, is the best way to keep out diseases. On every farm where a large herd is kept, there should be a small building apart from the rest to be used for diseased animals, that should be kept apart from the rest of the herd. Every member of the herd should be examined at least once a day by the owner or his assistant, to note the least symptoms of disorders, dullness, loss of appetite, rough coat, etc. Therefore experience is needed on the part of the caretaker to correct these faults at the beginning and thus maintain the health of the herd.

If the owner is unable to attend the cows he should hire a man that he knows he can trust. A man working around a stable must be quiet, regular in his work and of an even temper. All work that is done about the herd should be done at a regular time, as stable cleaning, grooming, watering, feeding, milking, etc.

It is not unusual to find some cows that show no signs of drying off after dropping the second or third calf. It shows a good dairy trait but it pays to have the cow dried off at least three weeks before she drops her calf. When the time comes to dry off the cow the grain should be gradually withdrawn. If the milk does not cease to form, skip one milking and after this milk but once in two days, thus extending the drying over a period of two weeks. The cows when dry may be kept on pasture alone or on a low stable diet until about two weeks before freshening. The stable diet should include a share of succulent food as roots or silage. Two weeks before freshening, her rations should be increased. Wheat bran is a good material to be used at this time.

The best practice among dairy cattle is to remove the calf from its mother within twenty-four hours and teach it to drink. From the time the milk ceases to be the main food of the calf until it becomes a cow, its rations should be given with a view to nourishment and growth. When the pasture is good there is no better food than grass, but if the grass becomes short and dry, the young stock should be supplied with clover hay, wheat bran or oats. In the winter the young stock should receive in their ration quite a large amount of silage and very little grain, only enough to balance the ration. A fall calf well bred and grown should calve when about two years old and ought to make a good cow.

In a few words, to make dairying a success, the dairyman must consider the markets around him and then choose a breed which is suited to the work required. When only a small amount of capital is available, it is better to buy a pure bred bull which possesses merit first, and then with the remaining money get as many good grade cows as possible. Records should be kept of each cow and from the best the heifer calves should be saved and raised. Continual selection should be practiced and this can be continued until all the cows are high grade animals of good producing ancestry which, while not as valuable themselves as pure breds, will give nearly as good returns. To succeed, the breeder must have a knowledge of and love for animals and take pride in his work.

THE CROP SYSTEM MOST SUITABLE FOR USE BY DAIRY FARMERS.

By Hervey S. Bean, Kent's Hill.

(Prize Essay)

The ideal crop system for dairy farmers is the one which will supply to the dairy herd the greatest amount of nutritious, succulent food at the lowest expense. It is hardly possible to furnish the entire balanced ration from the products of the farm, and if it were possible it would not be profitable to do so. It is often better to buy concentrated feed to balance the animal's ration, even selling some of the farm products to pay for it. The expense for concentrates should be kept as low as possible with consistent feeding, for a "penny saved," or kept on the farm, "is a penny earned," in this case as in others.

In planning the crop system for a dairy farm there are two important considerations; first, we must consider the location, climate, condition of the soil and the cost of production; second, what crops, that are adapted to these conditions, will furnish the greatest amount of nutrition and will make the most nearly balanced ration.

Perhaps it would be well to consider the purpose of a system of rotation of crops. It has been found, by well conducted experiments, that no crop will do its best if grown continuously on the same ground. It is known also that after a few years the crop will cease to grow even if commercial fertilizer or manure is applied freely. Any crop will soon exhaust the available plant food of the soil so that the fertility will have to be renewed, and rotation of crops has been found to be the cheapest means of restoring plant food to the soil.

Another advantage of a well planned rotation system is that it helps to solve the labor problem. As the rotation system spreads the work of preparation and harvesting over a longer period, it is not necessary to hire a large crew when wages are high.

Scientific rotation of the crops includes grasses, legumes, a cultivated crop, and small grains. Legumes restore humus and nitrogen to the soil, and take much of their own food supply from the soil below the extent of the root systems of other crops, and from the air.

The grasses break up the subsoil by the penetration of their roots and store up plant food, which, under the influence of the air and sunshine, quickly becomes available for other plants.

A cultivated crop gives a good opportunity to check weeds, lightens up the soil, and allows the air and light to break up the elements into available plant food.

The grains, besides their importance as food, are valuable as nurse crops for the young legumes.

While no set rule can be made, owing to the difference in climate and soil in various sections, the crop system which meets these conditions the best throughout the country where dairying is carried on is one composed of corn, oats, red clover, and timothy, forming a four or five year rotation.

Corn is the standby for dairy farmers everywhere. It gives a chance for cultivation of the soil and the destruction of weeds, and also furnishes an abundance of desirable roughage at a low cost. It is the most reliable grain and forage crop that is grown in the United States. With fair preparation of the soil and a little attention, it is sure to produce a crop, but with better preparation of the soil, and more fertilizer and more attention, the corn crop is certain to more than pay the difference in the cost of production.

For the country at large a variety of dent corn is the best, although in some northern sections flint corn is more likely to mature. The variety selected should be one that will reach maturity before the early fall frosts.

The ground for corn may be plowed either in the fall or the early spring as is most convenient, unless the conditions of the soil require spring plowing. Eight or ten cords of manure should be applied to each acre and either plowed under or harrowed in. Then three to five hundred pounds of commercial fertilizer put in the drill at planting time will do much toward starting the root system. The corn should be planted as early as the season will permit, so as to have plenty of time to reach maturity.

The corn should be harvested when in the glazing stage and put into the silo without much delay, although some farmers believe that a better quality of silage is produced if the silo is filled slowly. This silage may be fed throughout the winter season and the following summer while the pasturage is poor. This is a better way than the growing of soiling crops, for most dairymen, since it requires less time to feed during the summer season when time is expensive.

The following spring this ground should be replowed and a mellow seed bed prepared. If a grain drill with a grass seed attachment is at hand the seeding can be done at one operation. The oats should be sowed at the rate of about two and one-half bushels to the acre, with a mixture of clover and grass seed, eight to ten pounds of timothy and six pounds of red clover to the acre.

The oats may be cut before the grain matures, while the leaves are green and the straw soft, in which case they make excellent hay, ranking higher in protein and fat than timothy hay, or they may be allowed to mature and then be cured and threshed. Oat straw is higher in feeding value and is more readily eaten by stock than the straw of any other grain. Oats compare favorably with wheat in feeding value, although they contain a larger proportion of crude fiber. In protein, they are a little lower than wheat but are higher than barley or corn, containing nine and two-tenths pounds to one hundred pounds of dry matter. They are rather low in carbohydrates, containing forty-seven pounds to one hundred, compared with sixty-five to sixty-nine in other grains; but they contain as much fat as corn, four and two-tenths pounds, and twice as much as found in wheat and barley. The green oats will make a good substitute for pasturage or silage in the summer.

Red clover is always an acceptable feed in the dairy barn, whether fed green in the summer, cut into the silo or cured for hay. Red clover is rich in protein, and protein can be supplied cheaper in this form than in bran, oil meal, or other expensive purchased feeds. So we see that clover furnishes a large supply of nutrition, especially protein, which is needed in abundance for the production of milk, and which is at the same time, the most costly nutriment to buy. Clover hay fed with ensilage balances up well as a ration. The clover furnishes the protein which the corn silage lacks, while the corn furnishes carbohydrates and fat.

Timothy is the leading grass for hay in the country. Sown with red clover, a large crop of valuable hay will be produced the second year, and also the third, although it is better to turn it under and plant to corn again when possible, thus keeping a four year rotation.

The extensive use of timothy is due to the certainty of getting a catch, the large yields of hay produced, the cheapness of seed, the ease of curing the hay, and the fact that dairy cows, as well as all classes of animals, will eat it without waste. Timothy is lower in protein than most of the grasses, but is about equal in other food materials.

In the south, cowpeas are a valuable crop for feeding cattle and for soil improvement, but the fact that they will not mature farther north than Kansas, Kentucky, and Maryland limits their use to the southern states.

The crop system outlined should keep the soil mellow and rich in plant food, and not only maintain the fertility of the soil, but increase is productiveness. Along with the increase in crops there should be a corresponding increase in the value of the farm, and an increase in the amount of stock kept on the place.

On farms where a corresponding rotation has been used, there are as many dairy cows kept as there are acres of tillable land.

One example of the value of such a rotation is shown in the case of Hon. C. L. Jones, of Penobscot county, Maine, in 1908. He was keeping forty head of cattle, four horses, and twenty sheep on forty acres of tillage land. His rotation consisted of one year of corn, one of small grain, one of clover hay, and part of the land was run for mixed hay the second year. The manure was applied either as a top dressing or on the land to be used for corn.

Another illustration is that of Mr. D. H. Noyes, of Grafton county, New Hampshire, in the same year. His farm comprised eighteen acres of tillage land and one hundred and fifty of rough pasture. He practiced a four year rotation, consisting of one year each of corn for silage, oats cut and cured for hay, clover also cured for hay, and mixed hay. He kept eleven cows, three young cattle, three horses, and thirty-two sheep, buying only twelve tons of grain for the year.

Mr. C. F. Smith, Lamoille county, Vermont, on a farm of one hundred and fifty acres, half of which is field, supplies the roughage for fifty-five milch cows, twenty-five young cattle, and eight horses. His rotation is corn, oats, clover and timothy.

BUSINESS MEETING OF THE MAINE SEED IMPROVEMENT ASSOCIATION.

ANNUAL ADDRESS OF THE PRESIDENT.

L. C. HOLSTON.

In these "times which try men's souls," the world is confronted by this question,—Who will feed the world? No nation can thrive alone. One nation cannot be at war without every other nation feeling the results. When many nations are fighting each other, the whole world is depressed. You may resolve that you will not talk of war, but whenever you make a resolution that is contrary to nature, you will break it.

Germany, Russia, England, Austria, have talked peace for several years. During this time, instead of disarmament, each country has increased its fighting strength. Each country has had belligerent thoughts, admired its splendid pageant of war, and then used its equipment. With Europe deep in carnage we cannot sit secure. When part of the race is in the throes of death, no other part has health. Brother fighting against brother! The untilled land horrible with the life blood of youth and men! The homes desolate! Every house a home of mourning! Women bowed with grief and a double burden too great for any one to bear!

What is victory when millions mourn? Of what use are laurels when the world is hungry? Who will furnish food, clothing and shelter?

We, all of us, are a part of this great human family. Its wants, needs, griefs, joys, cares, hopes, fears are ours. We are one. When a part of the world is hungry and suffering, who can be comfortable? Who is going to feed the world? Almost one-third of the German population is engaged in the occupation of agriculture. In Austria, almost half the working people are farmers. Hungary is a food producing country. Belgium is a manufacturing country; Servia an agricultural country. Russia now imports fruits, vegetables, and oils, and exports cereals and cattle. Italy exports fine food stuffs, as does France. England cannot feed herself in times of peace. Not quite one-eighth of the American working population is engaged in agriculture. America has, more than any other country, a system of economy and uses science in the work of agriculture. We have the most efficient implements in the world, and yet we cannot supply our own needs, without the cost being comparatively high, due in large measure to poor seed.

Who is going to coax from the earth food to feed the armies of Europe and their families, who a few months ago were peacefully plowing their fields? A terrible burden has fallen upon the world. The men in the armies, who are engaged in destroying, must be clothed and fed by some one other than themselves. Armies produce only death and destruction. Their people who remain at home cannot do much to relieve the burden. The women, their children, and the aged men were busy before the war.

We, the people of America, have a problem we never had before. We must feed ourselves and who shall say how many more. How much of your time does it take to provide for yourself food such as you now demand? How much for clothing and shelter such as you demand?

This is an age of luxury. We cannot be confined to primitive necessities without loss mentally and physically. How much time does it require for heads of families to provide food, shelter and clothing for their families? Double this time, and see the appalling figures. How are we going to adjust ourselves to these new conditions, without suffering loss? We do not want to get along with less living but with more. The times demand that we use our brains, not as academic scholars but to solve new practical problems. "Back to the soil!" is the command of the times. Use the finest brain developed in commerce to organize the production and marketing of agricultural products.

One man farming alone has unceasing labor. Few choose such agriculture, as an occupation, for that reason. Think of the toil once required to produce a bushel of wheat! At the first sign of spring, the farmer begins to plow and prepare for the sowing of seeds. That is the way he pleads with the earth to bring forth a harvest. It takes an immense amount of faith to put seed in the barren earth and intelligently expect a harvest. Only a man of imagination, a poet, can see in the seed delicious fruits; but farmers lose more by bad seeds than from almost any other preventable cause. They not only lose on the amount paid for bad seed, but they often lose a crop and possibly a year's time. The states ought to take hold of this seed question much more vigorously than they have, for it is a fraud against which the innocent buyer has practically no protection.

Let us, as members of the Maine Seed Improvement Association, do all we can to boom Maine by making it the leading state for the production of high yielding seed, true to type and of a quality to attract the buyers. I wish the growers of seed in our state would take a stand to allow nothing to leave their farms that could not carry its tag of merit. The economy, both to producer and user, would be incalculable. It would follow that other states would have to fall into line or lose out in the race.

What a shame it is that seed buyers from out of the state, have to make the statement that unless more reliable seed is forthcoming they will have to go elsewhere, that the grower often loses as much on account of mixed seed as the seed costs him. Why cannot the rogue grower be suppressed by law, and the untrained educated, that the honest grower may live. Powdery scab can do us little more harm than can the dissemination of inferior seed stock. It is our duty to grow good seed and push poor seed off the map of Maine, and in that way aid the nation to produce more to help feed the world.

The average farmer produces enough for his family's use and sells enough to pay his taxes and the interest on his mortgage. Farmers do not live luxuriously. It is only recently that they have begun to keep books and had scientific knowledge on farming. Now that we must multiply our toil, use our brains and feed the world, the best intelligence of America should be used for the production of food.

Who will feed the world? That is a question we must answer in deeds. The cost of living not only is to rise but it has risen.

Everybody who has a brain has a chance to work on the problem of how to produce food. Those who solve it are the great heroes.

War is upon us. No nation can be at war and any nation at peace. Americans must manifest their power in fighting ignorance. We must use our brains to produce food for the world.

REPORT OF THE SECRETARY.

C. R. Leland.

This association has held two executive committee meetings in the past year, the first one at the State House on January 29th and the second one at Highmoor Farm on August 20th. At the State House the business of the executive committee meeting was to appoint the Annual Meeting of the Association here at Bangor, and to take up the matter of how best to improve the quality of the seeds which would be grown by the members of the association this year. At that committee meeting Mr. R. B. Harrison of New Jersey, who is one of the large potato growers in that state, and Dr. W. A. Orton of the Federal Horticultural Board at Washington were present. They told us something about the requirements of the southern growers and the seed potato industry in the south.

At last year's annual meeting we voted, as an association, to take some steps to place the association on a business-like basis, and to take some steps towards standardization of varieties and towards a reduction of the amount of disease. A plan of seed certification had already been adopted by this association and it seemed best to revise that plan a little and to adopt a method of seed certification in which the Department of Agriculture and the Seed Improvement Association should coöperate, for this reason,—that anything which is guaranteed by the state carries more prestige with it than that guaranteed by an association such as our own. A committee was appointed at that meeting, consisting of Mr. Porter and your secretary, to confer with the Commissioner of Agriculture and to arrange some such plan in its details.

At the second meeting of the executive committee, held at Highmoor, we revised the premium list and made arrangements for this annual meeting. The committee appointed by the executive committee to confer with the commissioner arranged a plan something like this: That a small entry fee should be charged for entering potatoes for inspection and certification, the greater part of the expense being borne by the state; that those who entered potatoes should make certain reports, those reports returnable to the secretary of the association wno is also in the department, and that records be kept of every visit of the inspectors and of all the details connected with the work. There were six inspectors doing certification work the past year, including your secretary. They inspected about 225 farms at least once, and a great many of them three times. The total number of acres of potatoes certified was 222. Total entries were 579 acres. The varieties were largely Cobblers, next Green Mountains, then Gold Coin, Pride, Red Bliss, Eureka, and various others in smaller amounts. We also did some work with grain. I have not the exact figures with me, but I think we certified the grain from about 40 acres, perhaps a trifle more. We are ready to say that the grain grown on those 40 acres or more is free from smut in this year's crop, that it is true to type and of high yielding qualities, those three things being the most important in the matter of grain.

The total expense of inspecting the 579 acres entered for potato inspection was approximately $1400. The small entry fee which was charged amounted to $380, and the state has borne the balance of the expense, some $1020 for doing this certification work in the past year.

We have looked into the matter of seed markets a little during the year. We have talked and corresponded with many of the managers of sweet corn factories, in regard to seed corn, and we find that as soon as we are ready to produce corn which we can guarantee they will take up with the use of Maine grown seed corn for the factories in Maine. In fact, some of the factories are already producing their own seed,—hiring their patrons to grow seed for them according to a standard which they set. And we have got to set a standard because you and I might not have the same idea of what will cut best for the factory, what will make the best appearance in the can. We must make a standard for our factory corn taking into consideration type and appearance in addition to the usual qualifications for good seed.

We have corresponded with the market bureaus and seed bureaus of several of the states and experiment stations, to get an idea of what they want for seed potatoes. There are three things which we must have in growing the best seed potatoes,—freedom from disease, purity to type, and yield. It was these things that led us to adopt a system of certification because without inspection we could not be sure of the disease conditions; also without inspection we could not be sure of purity because the time when plants are in the growing period is the time when the varieties can best be told, and the buyers, whether in our own state or some other state, must have a guaranty. They must know that the seed which they are buying is just what we recommend, just what we state it to be. We have this year potatoes, grain and corn which can be sold under the guaranty of this association and of the state department, and it seems to me that we should advertise this seed. We have already advertised it in small ways, by means of personal letters and letters to other states, but I offer for your consideration whether it would not be best to put a small advertisement, for instance, in a New England paper and a State of Maine paper,—a small block advertisement, stating the kinds and amounts of seed we have for sale that are worthy of the guaranty from this association.

The standardization of varieties was suggested at our annual meeting last year, particularly in regard to potatoes. And potatoes are not the only crop which could be standardized. With corn, beans and grains, we have too many varieties which are very nearly the same type, and too many strains of the same variety. I have here a list of varieties of potato, standardized by Prof. Stuart of New York, in which he grouped the different varieties according to their characteristics. They are as follows:

GROUP LIST OF VARIETIES.

Group 1, Irish Cobbler Group	Early Dixie, Early Eureka, Early Petoskey, Early Standard, Early Victor, Irish Cobbler, Sutton's Flourball.
Group 2, Quick Lunch Group	Quick Lunch or Noroton Beauty, Triumph, White Triumph.

Group 3, Early Michigan	Early Michigan, Early Puritan, White Albino.
Group 4, Section 1 Early Rose Group	Clark's No. 1, Early Rose, Country Gentleman, Early Sunrise, Early Thoroughbred, Early Walters, Houlton Rose, Late Rose, Rochester Rose.
Group 4, Section 2 Early Rose Group	Early Manistee. Rose No. 4 or Spaulding's Rose.
Group 5, Early Ohio Group	Early Acme, Chicago Market, Early Ohio, White Ohio.
Group 6, Section 1 Beauty of Hebron Group	Beauty of Hebron (Early and Late), Columbus, Crown Jewel, Early Norwood, Gem of Aroostook, Early Bovee (Hen), New Queen, Star of the East, Vigorosa.
Group 7, Section 1 Burbank Group	Burbank, Knowles' Big Cropper, Longfellow, Money Maker, Pride of Multnomah, White Beauty, White Chief.
Group 7, Section 2 Burbank Group	Cambridge Russet, Golden Russet, New Wonderful, Russet Burbank or Netted Gem, Salzer's Scabproof.
Group 8, Green Mountain Group	Carman No. 1, Clyde, Bethel Beauty, Delaware, Empire State, Freeman, Gold Coin, Green Mountain, Keystone, Long Island Wonder, Norcross, State of Maine, Uncle Sam.
Group 9, Section 1 Rural Group	Banner, Carman No. 3, Knockout, Late Victor, Lily White, Million Dollar, Non-Blight, Noxall, No. 9, Sir Walter Raleigh.

Group 9, Section 2 Rural Group	Dibble's Russet, Late Petoskey.
Group 10, Pearl Group	Pearl or Peerless, People's.
Group 11, Peachblow Group	McCormick, Round Pink Eye, Perfect Peachblow, Jersey Peachblow.

NON-CLASSIFIED.

Idaho Rural, Up-to-Date.

Each of these different classes represents a characteristic of its own, some peculiar type or growth of plant or tuber formation. It seems to me that instead of making a standard of our own we should adopt some such standard as this.

I would like to mention at this time the Minnesota Dent corn which was tested out in Hancock county this past year. A certain banker in Minnesota sent to the Union Trust Company of Ellsworth 80 odd ears of White Cap Dent corn, which matures in that state in 90 days. These were put out one ear to a farm, in Hancock county. The Union Trust Company asked us to make a set of rules for growing this corn and we made what we called the "Twelve Golden Rules of Corn Growing." If these rules were followed closely, according to each man's conditions, they would give almost an ideal condition of corn growing. Of course that does not take into consideration the climate and soil conditions as much as it should. We also sent each man a report to fill out at the end of the season showing how closely he had followed the plan outlined for him, and asked him to give us the yield in pounds of corn and the proportion of it that would do for seed. I believe I have reports from 12 or 14 of these 80 odd men, and about half of them have corn that has matured this year. I am a little disappointed in one thing: The Union Trust Company has offered special premiums on this corn and there is only one man who has taken advantage of that offer.

Last spring we sent several samples of our flint corn to Montana, the eight-rowed and twelve-rowed and other varieties, for testing in that state. I have written Mr. Mills, who has charge of the experiment, but have not heard from him. It would be interesting to us to know what results were secured in Montana with our flint corn.

The standing of the association at the present time is good. We have no men who are now members who are not interested, I believe. The paid-up membership for 1914 is 76. Your secretary has collected during the year $56 in dues. On May 14th he paid over to the treasurer $40, and he has on hand at the present time $16.

It will be necessary to ask the legislature for another appropriation to take care of the expense of these annual meetings, and I would suggest that a committee be appointed by the Chair to attend to the drafting of a bill to be put before the legislature.*

There are some other things which I think we should consider as an association. I will mention some of them briefly, and if you care to consider them it might be well to take them up at this meeting. One of these is, Shall we increase our membership fee at this time? The association is planning to do a lot of work. We have already done some work and it must grow or we will go back. To do work it is necessary to have money. Our present annual fee of 50 cents a year gives us only about half enough to pay for the meetings of our executive committee and such other necessary expenses as we have from time to time. All expenses for stationery and clerk services the past year have been paid from Department of Agriculture funds.

Another thing,—we have probably as good seed laws in this state as they have in most of the other states, but it seems too bad that when we buy seed, although it may be marked with a certain percentage of purity, we do not know of what the impurity may consist. We do not know whether it is one kind of weed which is pernicious or another kind which is not. We do not know whether it is chaff or something else; and the

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*I would recommend an increase of the appropriation because if this association is to continue to grow as it has in the past two years we shall need very much greater resources for offering premiums and conducting our meetings than we have had in the past. I should say that not less than $700 would suffice for the next two years.

amount of weed seeds in a pound is something enormous. Of some kinds there are over 400,000 to a pound, which is enough to put quite a good scattering over an acre. We also do not know how much of the seed we are going to plant will grow. We go to the grain dealer or seed dealer and buy so much grass seed. On the tag is plainly printed, according to the laws of the state, the percentage of purity, but how many of those seeds out of 100 will grow? I ask for your consideration whether it would be advisable for this association to start a movement leading towards the adoption of a law requiring germination percentages. I will say further that I have been a little bit interested in the matter and I have sent to some of the different states asking for seed laws, and I have some of the seed laws. If the association wishes to take it up, anything I may have will be turned over to the committee in charge.

You may be interested to know the amount of money expended by the association at its last annual meeting. We turned back $12 to the State Treasurer, expending $488. This year, owing to the kindness of the Commissioner, we have offered $554 for premiums. The Commissioner has offered to pay the expenses of this meeting out of other appropriations, making it rather an Institute affair. If the whole expense of this meeting should be kept under $500 it would be a small exhibition and not of very much value to us as seed growers.

We must continue to study plant diseases. We must do more educational work among our own members in regard to diseases, coöperating with the College and the Experiment Station which are trying to do this work. We must find, or assist our members in finding, the best market for the seed, and assist them to find a better method of marketing that seed. We should discourage the indiscriminate planting of untested varieties of seed. We plant too many seeds which will not grow. The one thing which perhaps would be of the most benefit to every one of us individually would be a better understanding and a better knowledge of the seed breeding work and other work which is being carried on by our Maine Experiment Station and a greater use of the knowledge which we get upon our own farms. It seems to me like this: Ninety-five per cent of the ordinary farmers cannot breed seed. We have not the time and we may not have the ability. The Experiment

Station makes it their business. They have a man who is trained to look for the different things which must be taken into consideration in the breeding of varieties. It seems to us that we should select our seed and that the Experiment Station and other scientific people should breed the seed. One of the things which this association should do, in the opinion of your secretary, to make its greatest development, would be to enlarge, increase and develop the seed certification plan, because that, it seems to me, can be spread almost indefinitely, to include all varieties of seed which we grow here in the state, and make a guaranty which means something.

I heartily thank everybody who has helped me in the past year to perform in my poor way the duties of secretary of this association.

Respectfully submitted,

C. R. Leland,

Secretary.

Voted, That the report of the Secretary be accepted.

On motion of W. G. Hunton, voted that a committee on resolutions be appointed by the Chair, consisting of three members, to report at the meeting to be held Dec. 10th. This committee was appointed as follows: Dr. Raymond Pearl, A. E. Hodges, C. A. Day.

On motion of Mr. Leland, voted that a legislative committee be appointed by the chair, to place the necessary matters before the legislature.

Mr. Adams: This is a very important committee and it is very necessary to get members on that committee who can attend to it, and for that reason I think it would be well to give our chairman until the next meeting to appoint that committee. Then he can get in consultation with members and find out whether they can serve or not.

The matter was laid on the table until the next meeting.

Dr. Woods: I want to say a word in relation to putting into the law a requirement in regard to the germination test. Some of the western states have put that in, in my judgment very unwisely. The trouble is that no uniform methods of germination have been worked out. If you send exactly the same seed to the Maine Experiment Station, to Washington and to California, you will get three very diverging results. There is a National Association of Seed Analysts that are endeavoring to work out a uniformity of methods, just exactly as 30 or 40 years ago we began with the Official Agricultural Chemists to work out uniform methods in the analysis of fertilizers. I think it would be unwise at present to incorporate in any law anything in regard to germination because different laboratories get different results. Vitality is, next to purity, the most important thing relative to seed, but until we can get uniform laboratory methods I trust this association will take no steps towards placing it in the law.

MR. ROBERTS: The matter of appropriation has been mentioned. You all understand that the heads of departments are required to make a recommendation to the legislature through the State Auditor of the amounts which they think will be required in their departments, and in my recommendation I put the amount for this association at $600. Of course I would have been glad to make it a great deal more than that but there are a good many departments and a little increase in each makes a total of quite a large increase. In addition to that, we have an appropriation of $3,000 for agricultural statistics, seed work and other miscellaneous work, and I have recommended an addition to that appropriation of $1,000, the idea being that quite a percentage of this $1,000 could be devoted to the seed work. I mention this to show you that the Department is trying to work along the same lines in which you are working.

MR. LOWELL: Our Secretary has made a number of very good suggestions. I think the first one he made was in regard to dues. The question is whether they should be increased or not. As a general rule among the people I think what costs them little they value low. It has been costing us 50 cents a year, and consequently the seed improvement work has not been valued very high. I think the fee should be doubled at least. I move that we take up that question now.

MR. ADAMS: It is nearly time to adjourn, and would it not be well to have a committee appointed? I move that the recommendations of the Secretary be referred to the committee on resolutions and that they report upon the same tomorrow.

This motion was carried.

On motion of Mr. Leland it was voted that the Chair appoint a nominating committee of three, to present at the meeting tomorrow the names of officers for the ensuing year. Prof. G. E. Simmons, J. L. Lowell, and A. S. Cottle were appointed as this committee.

REPORT OF VISITORS TO THE COLLEGE OF AGRICULTURE.

Your representatives to the College of Agriculture met and conferred with representatives from allied organizations in the state during Farmers' Week at the College. We decided to form ourselves into a committee and report our joint findings and submit recommendations as a committee to our respective organizations.

The increased and increasing number of students in the College has necessitated several changes even in the recently erected agricultural building, Winslow Hall, in that partitions have had to be removed to increase size of laboratories and recitation rooms. A thoroughly equipped bacteriological laboratory has been thus installed and a seed display room has been begun and if the present plans are carried out this room will be an education in itself in seed selection and testing.

We deem these improvements to be wise and in our humble judgment a good start to make this State College an example and a place where authoritative knowledge on agricultural subjects may be looked for and found.

Along this line of thoroughness, it would seem that our legislators, if not already acquainted, should be made acquainted with the desirability and needs for continuing this work in every line of agriculture.

To this end we make the following recommendations:

First, that modern barns be built, the present structures being far from what present needs and modern requirements demand for approved housing of working and breeding animals and for certified dairy products. A stock judging pavilion should be built in connection therewith.

Second, that a new dairy barn be erected, as the present plant is entirely inadequate to furnish students with the required amount of instruction as laid down in the curriculum. This will have to be done to maintain the present standard of the College.

Third, that greenhouses and laboratories connected therewith be constructed for proper instruction and practice in floriculture, horticulture, soil, bacteriology, forestry, spraying and grafting. No argument is needed to convince one of the needs along this line after a single visit to the present structure.

Fourth, that a veterinary operating room is needed and it would seem to the committee that the present stock pavilion might be advantageously turned into such.

Fifth, that sufficient land should be used on the present property of the University or more land be procured, in order that the sheep and hogs might have sufficient pasture, as it is a conceded fact that continual housing or confinement is an impracticable method of economical production of such animals.

Sixth, that the associations we represent pass resolutions adopting these recommendations and do all in their power to aid in obtaining legislation to the end that the Agricultural College may become what it should be,—a place of highest authority for public information on all agricultural subjects.

Respectfully submitted,

C. S. McIntire,
L. E. McIntire,
L. C. Holston,
Committee.

Voted, that the report of this committee be referred to the committee on resolutions.

The committee on legislation was announced as follows: Dr. L. S. Merrill, L. E. McIntire, W. G. Hunton.

REPORT OF COMMITTEE ON RESOLUTIONS.

Resolved, That this association heartily endorses and will give every possible aid to the securing of an appropriation for a new dairy building and dairy barns at the University of Maine, believing that, as set forth in the report of the committee of visitors to the University, such an appropriation is absolutely essential to the proper development of the teaching and experimental work of the University.

Resolved, That this association notes with great satisfaction that the Smith-Lever bill providing for the support of extension work in each state was passed at the last session of Congress, thus providing for a considerable development of extension work in Maine; and that further, this association will, as an association and through its individual members, make every effort in the direction of ensuring that appropriate legislative action is taken in this state so that Maine may secure the maximum federal appropriation under the Smith-Lever Act.

Resolved, That the joint meetings of the Maine Seed Improvement Association and the Maine Dairymen's Association have been a great success, and it is the sense of the association that such joint meetings should be continued in the future.

Resolved, That the Maine Seed Improvement Association endorses the county demonstration work as carried on under the direction of the College of Agriculture, and that we would strongly urge the desirability of extending this work as much as possible.

Resolved, That the time has now come when the best interests of the Maine Seed Improvement Association demand that the annual dues be raised from 50 cents which they now are, to $1.00, this change to become effective at the 1915 meeting.

Resolved, That the association recommends and will give its hearty support to a general educational campaign looking towards the control and ultimate eradication of the powdery scab disease of potatoes, believing that such educational campaign is an essential addition to the measures already in operation under federal and state auspices looking towards the same end.

Resolved, That the association appreciates the efforts of the Bangor Chamber of Commerce, the citizens of Bangor, the press, the exhibitors, and all others who have assisted in making this meeting such a success.

DR. RAYMOND PEARL,
ALBERT E. HODGES,
C. A. DAY,
Committee.

Voted, that the report of the committee be received and the recommendations adopted.

An invitation from the Portland Board of Trade, to hold the Annual Meeting of the Seed Improvement Association for 1915 in Portland, was read by Mr. Leland.

Voted, that this communication be received and referred to the executive committee.

REPORT OF THE TREASURER.

RECEIPTS.

Dec. 2, 1913, Cash on hand	$89 61	
May 14, 1914, Cash from C. R. Leland, Secretary	40 00	
Dec. 3, 1914, Interest on time deposit	2 98	
Dec. 10, 1914, Cash from C. R. Leland, Secretary	16 00	
		$148 59

EXPENDITURES.

1914.		
Mar. 7, Smith and Sale, Secretary's pocket ledger	$3 00	
May 5, L. C. Holston, expense at Executive Committee Meetings and Boom Maine Meeting	9 58	
Oct. 29, Frank Lowell, expense Ex. Com. Meeting	90	
Nov. 3, R. L. Copeland, expense Ex. Com. Meeting Sept. 1913	3 50	
Nov. 3, Guy C. Porter, expense Ex. Com. Meeting Sept. 1913 and Jan. 1914	18 78	
Dec. 3, R. L. Copeland, expense Ex. Com. Meetings Jan. and August, 1914	7 60	
Dec. 7, Geo. V. Turgeon, engraving cup 1913....	55	
Dec. 7, L. C. Holston, expense Ex. Com. Meeting at Highmoor	4 19	
Dec. 7, Leon S. Merrill, State Federation dues	4 00	52 10
Cash on hand Dec. 10, 1914		$96 49

Respectfully submitted,

C. M. WHITE,

Treasurer.

Voted, that the report of the treasurer be accepted.

The nominating committee presented the following names for officers for the ensuing year:

President, L. C. Holston, Cornish.

Vice president, R. L. Copeland, Brewer.

Secretary, C. R. Leland, Mechanic Falls.

Treasurer, C. M. White, Bowdoinham.

Executive Committee, Guy C. Porter, Houlton; R. L. Copeland, Brewer; Frank Lowell, Gardiner; H. M. Woods, Orono.

Member Experiment Station Council, W. G. Hunton, Cherryfield.

Visiting Member to College of Agriculture, C. S. McIntire, East Waterford.

Representatives to Maine Federation of Agricultural Associations, L. C. Holston, W. G. Hunton.

Voted, that the report of the nominating committee be accepted and that Mr. Adams be instructed to cast the vote of the association for the candidates named. This was accordingly done and the list of officers as read were declared elected for the coming year.

Mr. Adams: At the meeting of the Maine Dairymen's Association it came out that the representatives to the Federation of Agricultural Associations had no report. The Federation itself had no money to furnish them with a copy of the report of their proceedings. It seems very desirable that we have a report so that the different associations can know what the Federation is doing and be kept in touch with its doings. The Maine Dairymen's Association at its meeting this morning passed a vote that the association should pay for a typewritten copy and I presume the members of this association will want to do the same. I move that the Seed Improvement Association shall furnish the funds to provide them a typewritten copy of the proceedings of the Federation.

Voted, that the Seed Improvement Association pay for a copy of the report of the minutes of the Federation of Agricultural Societies, to be furnished the members of the Federation from this association.

On motion of Dr. Woods, voted that a report from the members of the Federation from this association be incorporated in our Annual Report.

ESSAYS

By members of Boys' Potato Clubs, for twenty-five dollar prize offered by J. A. Roberts and C. R. Leland.

PROF. R. P. MITCHELL: Just a word of introduction in regard to the Boys' Potato Club work, as perhaps some of you may not be familiar with it. The Boys' Club work is a new institution in this state. It started a year ago in August, and we are just completing the first year's records. The club is an organization of boys between the ages of ten and eighteen years for the growing of some specific crop. In this state the crops are potatoes and poultry. Records are to be kept of every performance in the producing of the product, whether potatoes or poultry. They must keep an account of the cost of plowing, cultivating, harrowing, fertilizing and spraying,—all the operations that come into the production. With poultry the cost of feed must be kept, and everything that goes into the growing of poultry. Any boy in the State of Maine between the ages of ten and eighteen years is eligible to become a member of a Boys' Agricultural Club. The Maine Seed Improvement Association this year offered two sets of prizes. It offered three prizes for the best exhibits of potatoes, aggregating twenty-five dollars and Commissioner J. A. Roberts and Secretary C. R. Leland offered twenty-five dollars for the three best essays on "How I Intend to Grow My Crop Next Year." We have with us the three boys who won the prizes, who will now read their essays.

HOW I SHALL HANDLE MY CROP NEXT YEAR.

By ALBERT R. LINCOLN, Dennysville.

(Prize Essay)

This year of 1914 I raised my first crop, one-eighth acre of potatoes, under the supervision of William H. Burns, our local leader, raising the largest crop in this club at the least expense, also one of the best crops that has been raised on our farm for a number of years. But in 1915 I am going to make an effort "To Make the Best Better."

In November I plowed one-half an acre of ground for my next year's crop, plowing it seven inches deep, and turning the sod completely over. The ends of this plot are gravelly loam, but in the middle it is a little heavier, a light clay loam. The subsoil is a light clay. This piece of ground is well drained, and has been cutting hay for quite a number of years, and a fair crop was cut from it this year. It has a fairly good sod.

As soon as it is dry in the spring, I will pick the rocks from this plot, and I am planning to spread a little stable dressing on it, for, as we all know, the war in the east has diminished our supply of potash, causing a rise in the price of commercial fertilizers. This stable dressing will supply humus, as well as fertilizer, to the soil. Then I will harrow it with a disk harrow diagonally, lengthwise and crosswise until it is thoroughly pulverized and the manure well mixed with the soil, finishing it with a spring tooth harrow. I will follow out the advice which our farm demonstrator, Mr. Day, gave us at our Boys' Club meeting: "Harrow and harrow until it is harrowed enough, and then harrow some more." Then I will drag it with a plank drag to break up all the lumps, pack the ground so that the moisture will not escape, and smooth the soil off.

Next year I plan to use for seed Lowell Green Mountain potatoes. I will treat them with formalin, using one pint of formalin to thirty gallons of water, to prevent scab, black-leg, and other diseases. Immediately afterwards, I will green them by placing them on a board platform, one layer thick, in the sun, letting them remain there for at least ten days and not allowing them to chill. Then I will cut them into quite large, blocky pieces, two or three days before planting, using land plaster as a dryer.

Next comes planting. We have an Aspinwall picker planter; but although we consider it one of the best of its kind, I will only sow my fertilizer with it, and plant my potatoes by hand as I wish to be sure that every seed is there, one foot apart, and in rows 32 inches wide, covering them with the horse-hoe. I am undecided as yet how much fertilizer I will use; but whatever amount it is, I shall put half of it in the row at the time of planting, using as high grade fertilizer as I can procure.

As soon as possible after planting, I will begin to cultivate to keep down all the weeds that they may not choke out the potato plants. To conserve the moisture in the soil, and to provide a good bed of light soil around the plants, I shall cultivate them at least twice, and shall run them up once with a horse-hoe, going over them once with a weeder before they begin to break ground. Just as they do begin to break ground, I shall put on the rest of my fertilizer with the potato planter, and cover both the fertilizer and the plants with the horse-hoe. From then on I will cultivate them at least once a week, and after an interval of a few days, I will hoe them, following this up until the potatoes are so large that it will be impossible to go through them.

After I hoe them for the last time, I am going to set my cultivator as narrow as I can get it, and run through the plants very lightly to leave a dust mulch in the center of the row as well as on the sides. When potatoes are hoed for the last time, the horse-hoe generally takes all the loose dirt and leaves a hard place between the rows, and you will notice that the ground will crack open, leaving holes that serve as chimneys to allow the moisture to escape. I think that by running the cultivator through lightly as I have stated it will prevent this cracking open of the ground and conserve the moisture.

When the plants are six or eight inches high I shall begin to spray with Bordeaux mixture, to prevent early and late blight, and if there are any bugs, I shall add arsenate of lead or Paris green, and repeat every week or ten days, depending somewhat on the weather during the growing season. I will go through the potatoes with a hand hoe, if necessary, and cut out all the weeds as fast as they appear, not allowing any weeds to grow on this plot.

I dug my potatoes this year when they were a little too green and the skin started on them some, but next year I am going to leave them in the ground until they are thoroughly ripe. Also I will keep a note book, noting the condition of the crop during the growing season, will keep a strict account of all the material used and the time spent on my potatoes, and will carefully fill out all the blanks which are sent me.

I think boys' clubs are a great organization as they encourage "us fellows" to love to work on the farm. I did not realize until this year, that there was so much hard work and so much pleasure in raising the crop that was all your own. And I would say, Do not be discouraged under any circumstances if things do not go on smoothly, but hope that the season of 1915 will be so favorable that it will induce other boys to join our club, and help "To Make the Best Better."

HOW I INTEND TO GROW MY CROP NEXT YEAR

By Ulmer W. Davis, Machias.

(Prize Essay)

For next year I have selected a plat of ground of black loam because I think that is the best soil there is for growing potatoes. The land was sown to clover last year and in the spring I shall plow it under as this will help to fertilize it. I have decided not to plow it this fall because I think that during the early spring months, the melting snow washes the substance from the top soil of the earth that has been turned over. The plat is in a good sunny place and as it was plowed and harrowed this season, it is level and free from rocks.

I intend to do the plowing about the first of May. It will be best to plow the plat lengthwise, first making the back furrow in the center. To do this, it is necessary to make one furrow and then turn over another on the opposite side of it. After that, I shall go down one side of the plat and up the other until they meet the center row. All will be eight inches deep. The ground will plow smoothly because the land is level.

The more times the ground is harrowed, the better it will be and much easier to work. As I think a spring tooth harrow is the best there is, I shall use that kind. The plat will be harrowed lengthwise and then crosswise; repeating five or six times so that the soil will be well pulverized.

I shall stake off where the furrows are intended to be made so as to get them even because if they are not, it will make the plat look bad. I shall use a slow horse, for the cultivator will do better work. The rows will be three feet apart starting from the outer edge, and in order to make them six inches deep, it will be well to cultivate through them twice. By making them this distance apart it will allow me about forty rows of potatoes in the acre.

I am going to use fifteen bushels of Delaware potatoes and one ton of Sagadahoc fertilizer. I will be very careful in selecting my seed not to get any affected by disease, or any that are not smooth, because if I should plant potatoes that were rough and knobby I should receive unmarketable potatoes which would be counted at half price. The seed will need to be cut so there will be two eyes on each. After cutting, I will sprinkle a small amount of lime on them to dry the cut surface. I shall put the fertilizer in the furrows by strewing a good sized handful along a short distance in the row and then strewing another on top of it as that will be about the amount to use. After this is done I shall take a brush and drag lightly over the top to sprinkle a little soil over the fertilizer, because if I should drop the seed directly on the fertilizer, it would burn them. When planting I shall have a stick nine inches long to measure the distance between each one. The reason I am so particular about this is that if I should drop the seed too far apart, I would receive extremely large potatoes and these would be counted as cull potatoes which are unmarketable. After dropping the seed, I shall go between the furrows with a shovel plow to bury them; then I shall go over them with a hoe to cover neatly.

As soon as the plants break ground, I shall strew a small amount of phosphate along the side of the rows and then go through them with a cultivator to mix it with the soil and put it around the stem of the plant. If it is possible, I shall cultivate them every other day as this benefits them in every way. They will need to be hilled up about two times.

Beetles are sure to come as soon as the plants break ground. They can be kept off until the plant is large enough so I can use Paris green or arsenate of lead. In picking the bugs off, I shall wear a kid glove and go through the plat at noon hour when the sun is warmest because the bugs are on top of the leaves. The kid will prevent staining the forefinger and thumb. In harvesting, a shovel plow is a good implement to use. Many of the potatoes will be turned out over the ground and the rest can easily be dug with a hoe. If the potatoes are not wholly ripe, they will peel easily, so in order to avoid this, I will put mine in bags instead of throwing them into a cart.

After the potatoes are all harvested, next comes selling, marketing or storing. I am not certain, but I think I shall deliver my potatoes to Machias and stow them aboard of a car where they will be shipped to New York or some other city. I think I shall receive a better price by doing this than I would if I should store them and save them until spring.

HOW I SHALL PLANT MY CROP NEXT YEAR.

By Norris Bryant, Machias.

(Prize Essay)

Having been successful with my crop this year, I am planning to raise another next year.

If possible I shall select a piece of land lying on a slope so as to get a good natural drainage.

Potatoes will not decay so quickly if planted on a plat that is on a slope. I shall see that the land is plowed and harrowed thoroughly, for this is very important. It is nice to have all the soil pulverized; it will work much better when you come to cultivating and hoeing.

New ground or green sod requires much more harrowing than old ground to get the sods pulverized. If using spiked tooth harrow, it should be run lightly at first so as not to pull the sod to top, then it would be all right to let it go deeply. It should go lightly last to smooth it off. I shall have my drills three feet and three inches apart to give the plants plenty of room to grow. I think I get good results by letting them have plenty of room to grow. Perhaps you would like to know how I get my drills all the same width apart. I nail a four foot stick on a wooden frame cultivator having the end stick out over three feet, three inches. Then I put a peg or a six penny nail in the end of it. I then start my first row as even as I can; I then have no more trouble as the nail makes the mark where the next row goes. This will save much trouble when I cultivate as the rows will be straight and the cultivator will not dig the potatoes or the plants out. I can go along swiftly with the horse without taking so much care. I do most of my planting and work in the old-fashioned way; I think I get better results by doing it this way if I only have a few to plant. I generally get a birch tree, not so very large, and drag it through the drills to mix the soil and phosphate together and then the fertilizer will not remain on top to burn the potatoes. If the seed should get burned, the plants would not grow good for this rots them, and then there would not be potatoes enough left to nourish the baby plants till they got their roots and got their food from the soil. If this should happen, I should not get as good a crop as I would if I had been careful and not let this happen.

In selecting my seed I pick out medium sized ones about as large as hen's eggs. This is the same size I planted this year. I shall cut my seed very small. I think I get better results by doing this. I shall allow my seed about two eyes on a piece. I shall be very careful in cutting my seed that there are no rotten parts in them. If there is, this will cause waste of time as they will not grow very good, if at all. It will prove very valuable if you are careful in picking out your seed. I shall use Sagadahoc phosphate as I think this is the best; analysis, 4, 6, and 10. I shall use it at the rate of 1600 pounds to the acre. I shall strew it by hand. I am going to plant by hand, as I am going to enter a contest, I would be out of it if half of the potatoes were not planted as sometimes a machine skips, and it will use the phosphate just the same. I shall plant the potatoes from twelve to fourteen inches apart to give them plenty of room to grow, for if they get mixed up in the hills, they would not grow so well and then if I dug them by hand, I would destroy half of them by forking them. I shall plant flesh side up as I think the plants come up stronger. This is only a boy's idea, only twelve years old and I shall have to live and learn by experience. I shall plant Delawares; as I have been in the contest only one year and bought these last year, it will save the cost of buying seed. If I think there is any danger of scab disease, I will treat them for it by soaking them in formalin as recommended by local leader this year. I did not do this this year and they had a little scab on them but it is not dangerous. The man I got them of, an experienced farmer, said it must have been the result of putting ashes on the land I planted them on. I think this is a sure cure because some of the boys did it and none of their potatoes had scab on them. I shall cover them this way when I have them all dropped. I shall run the cultivator through the space left in between the rows and put as much dirt over them as possible, then I shall take my hoe and go over them and cover them up four inches deep. I think this is about the right depth to cover them.

Now that my potatoes are planted, I expect for them to come up in about two weeks. After I plant them, if they do not appear in that length of time, I shall run the cultivator through them so as to break the soil. This will give them more room to get to the top. As soon as they break through the soil, I shall cultivate close to the plants. If it should be very dry, I should cultivate often so as to hold the moisture. I shall continue to do this until there comes a rain and then there will be no need for this. When they are four inches high, I shall cultivate them thoroughly. I shall do this by going up one row and down it again with the cultivator. Then I shall take my hoe and cut between the hills. This will remove all weeds and loosen the soil which cannot be done with the cultivator.

When they are six inches high, I shall give them a thorough cultivating to loosen the soil to get them ready for the horse-hoe. I shall then use the horse-hoe and carry the dirt within six inches of the plants. Then I shall take my hand hoe and carry my soil in among the plants carefully so that I will not cut any of the stalks down. This shall be done late in the afternoon. If I should do this in the heat of the day, the sun would evaporate the moisture before it had any chance of doing any good.

Spraying I shall do before hilling up. When they are a foot high, I shall hill them up for the last time. I shall spray them with Bordeaux mixture, keeping my plot neat and free from weeds.

I hope that this work of getting the young boys and girls interested in farming will keep on, for this will soon be the chief work in America. I hope they will have the contest in Machias next year for we have had a good time in the Grange

Hall talking about farming and the contest. I hope that there will be many more join it next year.

Dr. L. S. Merrill: I have some interesting data that I would like to present to you concerning the work of these boys. Mr. Mitchell has told you something about the Boys' Club work and what he is trying to do in that line. You heard one of the boys refer to the motto of the Boys' Club work,—"Make the Best Better," and when I tell you something of the results that these three boys have had during the past year, you will see that it is really worth while to try to "Make the Best Better." The Boys' Club work is a worth-while work for the State of Maine to engage in.

Albert Lincoln, the boy who has won the first prize for his essay, according to the report made, grew at the rate of 468 bushels of potatoes per acre. Of course this was only one-eighth of an acre, but some of these boys as they grow older will use the entire acre. The smallest yield was 328 bushels. They made at the rate of $56 to $128 per acre profit, after paying for all the expenses, including labor, fertilizer and seed. So you see these boys not only have won a prize on the essay, but have really won a substantial prize in the knowledge that they can actually do a man's job in growing a man's crop and make money at it. More than that, they have demonstrated to Washington county what can be done in the growing of potatoes. I expect it is a source of pride to that county that all these prizes were won by Washington county boys.

We have had clubs this year in 30 different towns and we hope to extend the work and to get the support of the grown up people of Maine in this work of giving the boys an opportunity to do something that is really worth while and to win out.

I want to congratulate you, boys, that you have actually won out in two ways. You have actually carried on a demonstration in growing potatoes that will compare favorably with the work done by the farmers, and you have prepared an essay on "How to Grow Potatoes" which has won a prize. I want to extend to you the congratulations of the Maine Seed Improvement Association and of all the ladies and gentlemen present.

The prizes were then presented by Dr. Merrill.

ADDRESSES DELIVERED AT MEETINGS OF MAINE DAIRYMEN'S ASSOCIATION AND MAINE SEED IMPROVEMENT ASSOCIATION

OAT BREEDING AT HIGHMOOR FARM.

By Dr. Frank M. Surface, Orono.

The State of Maine grows annually about 140,000 acres of oats. The average yield per acre according to the United States Department of Agriculture is about 40 bushels, making in all a total production of nearly 6 million bushels. The annual value of such a crop is about three and one-half millions of dollars. As a wealth producer oats rank third among the crops grown in the state. It is of further interest to note that Maine produces more bushels of oats than the states of New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut put together. These considerations have led the Experiment Station to undertake some work looking towards the improvement of this important crop.

An average yield of 40 bushels per acre is some ten bushels above the average of the country as a whole. This indicates that our climatic and soil conditions are well adapted to this cereal. However, 40 bushels is by no means the maximum production that can be realized under our own conditions. We have now conducted variety and field tests at Highmoor Farm for five years and only in the very poorest year and with our very poorest variety have we obtained a yield as low as 40 bushels.

Now there are two general ways of increasing the yield of a crop. One is by using better methods in growing it and the other is to use better seed from better varieties. Our work has been confined to the latter of these two methods. In this work we are attempting to do two things. First, to determine which of the more popular commercial varieties of oats are best adapted to our conditions, and second, to originate new varieties which, being bred in Maine, will be still better adapted to our conditions.

The work of breeding and testing new varieties is necessarily slow. We have made some progress, however, and I will speak of that in a few minutes. The work of testing existing varieties goes more rapidly and we now have some results that should be of value to the oat grower in the central and southern part of the state.

Before turning to the actual results of these variety tests I would like to briefly outline the methods which we use in these tests. In the first place it is necessary for us to test each year a large number of different varieties. During the past season we tested at Highmoor 53 distinct varieties or strains. Each of these was tested in duplicate or quadruplicate. In all we grew 150 plots in our variety tests this year. Each plot had to be planted separately, harvested separately and threshed separately. Obviously in work as extensive as this it is not possible to grow large plots of each variety. Accordingly on the results of our own experiments and those conducted at other places, notably in England, we have adopted the plan of growing four small plots of each variety. These plots are located in different parts of the field. The average of these four plots is taken as the yield of that variety for the given year. In all 1-10 of an acre is devoted to each variety each year, but instead of being in a single piece it is in four separate parcels. In this way there is much less chance of one variety being seriously affected by differences in the soil.

These plots are planted with hand drills in rows six inches apart. The seeding is at the rate of two to three and one-half bushels per acre. We have found that some of the larger grained varieties must be seeded heavier than the small grained and this accounts for the difference in the rate of seeding. The best method of seeding in variety tests is not the same number of pounds to a given acre, but the same number of kernels. We have determined the average number of kernels in a given weight of each variety and then plant such a weight of each as will give approximately the same number of kernels. Thus a large grained variety, like the Senator, must be seeded nearly twice as heavy as a small grained one, like the Kherson.

In our experience one of the principal factors in securing a good yield of oats is to plant early. You cannot plant oats too early. We aim to plant just as soon as we can work the ground. At Highmoor this is the last of April or the first of May. Oats will stand a very heavy freeze without damage and they grow much better in cool weather. In some years our planting has been interrupted by heavy rains or other conditions and we have always found that the later seeded plots yielded much less than the early seeded ones of the same variety. Other factors which influence the yield are the preparation of the seed bed and the depth of planting. Oats must not be planted too deep. Most of our ordinary grain drills tend to plant the seed too deep. This is the chief reason why many people have had better results with broadcasting. The trouble with broadcasting, as it is usually done, is that many seeds are not covered at all. A happy medium is much to be desired.

We may now turn to the results of the variety tests. Tests of commercial varieties have been carried on at Highmoor for five years. In all we have tested 35 differently named varieties and in many cases several strains of each one. Some of these varieties have been tested one or two years and then discarded as unsuited to our conditions. Others have been retained because they showed certain distinct types. Every year a few new varieties have been added.

There are 11 varieties which have been tested for all five years. The five year average and the yield of each in 1914 are shown in the chart (Table 1). It will be noted that the yield in 1914 was exceptionally good. All of the varieties yielded far better than in any previous year. This was due in the main to the abundant moisture during the growing season and to the cool weather in June. Individual plots ranged in yield from 132 bushels to 60. These yields of course are higher than can be expected in a series of years.

TABLE I.

Varieties Tested for 5 Years. Yield in Bushels Per Acre.

Variety	5 year average	1914 yield
Irish Victor	68.7	88.6
Lincoln	67.9	87.6
Imported Scotch	67.8	86.5
Prosperity	67.5	88.8
Banner	67.3	94.8
Silver Mine	66.4	96.3
President	66.4	89.9
Reg. Swedish Select	62.7	83.2
Victor	61.8	78.6
Kherson	61.8	78.1
Senator	56.5	85.4
Average	65.0	87.1

From this it is seen that the average yield of the first seven varieties is practically the same. The Irish Victor still maintains a slight lead over the others, but the difference is less than one bushel per acre. The Regenerated Swedish Select shows a marked drop behind the other varieties in its average yield. The Swedish Select has been a very popular oat in this state but we have never been able to obtain very consistent results with it. It has several faults. In the first place it has a rather weak straw and in a good season lodges badly. Its yield is also greatly affected by environmental conditions.

The Victor is a black oat and is retained because it is a good type of a black oat. It has never yielded very well compared with the other varieties.

The Kherson is an early oat and matures about ten days before the other varieties. The Kherson has never done well for us at Highmoor although it is very popular in the middle west. A larger oat with a longer growing season is better suited to our climate. This at least is true for central and southern Maine. A preliminary variety test this year at Aroostook Farm showed the Kherson and the Daubeney, another early oat, to be ahead of the other varieties. There are some reasons for believing that these early oats may be well adapted to Aroostook conditions. In the first place they can be harvested eight to ten days earlier than the ordinary varieties.

There is less likelihood of a conflict between oat harvesting and potato digging and it also brings the harvest at a time when the weather is usually more settled.

Finally we have the Senator oat which on the average has been our poorest yielding variety. This is a horse-mane oat of a very pretty type. It has very heavy straw and broad leaves and very large heads. The grains are very large and plump. In the field it is usually picked as a winning variety but the threshing test is always disappointing. The reason is that it does not stool sufficiently. A heavier seeding will remedy this to some extent. The Senator should be seeded with three and one-half to four bushels to the acre.

Of the remaining varieties there are nine that have been tested for three years. The three year average and the yield in 1914 of each is shown in the chart (Table 2).

TABLE 2.

Varieties Tested for 3 Years. Yield in Bushels Per Acre.

VARIETY	3 year average	1914 yield
Early Pearl	77.3	98.1
Minnesota No. 26	75.3	105.5
Gold Rain	72.6	98.8
Siberian	67.0	80.0
White Plume	66.9	93.3
Abundance	62.7	76.0
American Clydesdale	62.4	77.4
Rebred 60-day	61.0	81.2
Daubeney	59.0	81.6
Average	67.1	88.0

It is seen here that the Early Pearl leads the list with an average for the three years of over 77 bushels per acre. As you all know, no doubt, this variety was bred by our vice-president, Mr. Copeland. It is a very excellent oat and one of the most promising varieties that we have yet tested. In one respect it is misnamed for it is not an early oat. It requires at Highmoor 108 to 110 days to mature, a longer period than any variety in our test except the Siberian. This is not a bad fault in our climate, however. It is an excellent oat for central and southern Maine.

Two other varieties, the Minnesota No. 26 and the Gold Rain, are close competitors of the Early Pearl for first honors in this three year test. In fact, they gave a slightly higher yield in 1914. The Minnesota No. 26 yielded as an average of its four plots 105½ bushels per acre this year. One plot of this variety yielded at the rate of 132 bushels. This oat was originated by the Minnesota Experiment Station some ten or 12 years ago. It has been very popular in the northwest and our results show that it is well adapted to our conditions.

The Gold Rain variety is a beautiful yellow oat. It was originated at the Experiment Station at Svälof, Sweden. For a yellow oat it is proving to be exceptionally good.

The remaining varieties have yielded at lesser rates. It will be noted that the Rebred 60-day and the Daubeney, two early oats, have given much smaller yields than the later varieties. This agrees with what I have said about the Kherson.

We may next turn to the second part of the work, viz., the attempt to breed new varieties. Several methods are being used in this work. In the first place we go through the plots of the commercial varieties and select individual plants which show special merit. The seed from these plants is grown separately and those which appear to be better than the varieties from which they come are multiplied and tested in the regular variety test.

The oat flower is naturally pollinated by its own pollen, i. e., it is very closely inbred. This results in the condition that the progeny of any one oat plant will breed true when grown in successive years. Thus if we can find an oat plant which shows some inherent good quality we have simply to multiply the seed from this one plant and we can have a whole field showing the same quality. Such a strain originating from a single plant is known as a "pure line." This method of breeding consists in testing a large number of individual plants and then multiplying a few of the best and testing them under field conditions. Most of the improvement which has been made in oat varieties has been through the isolation of such pure lines.

On the other hand it is practically certain that no further improvement can be made in a pure line by continued selection. Once a pure line is isolated we cannot improve it by selection. Our only chance of success in this kind of work is to find in nature a pure line which possesses the qualities we desire. By means of hybridization, however, it is possible to combine the desirable qualities of one strain with the good ones of another. We are doing a great deal of this hybridization work at Highmoor. Some 8000 hybrid oat plants were grown this year. But results from this work come slowly and it will still be several years before we can be certain of the qualities in our hybrid strains.

In 1910 some 350 individual plants were selected from the variety plots of that year. The next year the seed from each of these plants was grown in a separate row in the oat garden. Each row was harvested and threshed separately. The next year about 80 of these pure lines were tested in small plots (1-2000 of an acre) in the oat garden. Finally in 1913, 30 of the pure lines were judged good enough to be tested under field conditions. These 30 pure lines were tested again in 1914. On the basis of these two year tests half of them have been discarded as showing no quality essentially different from the commercial varieties. Thus out of 350 original selections 15 have been judged good enough to offer to the public. The yields of these pure lines for the two years and for 1914 are given in the chart (Table 3). It will be remembered that each of these "pure lines" (essentially new varieties) are the descendants of a single grain planted in 1910.

TABLE 3.

Yield of Pure Lines of Oats Bred at Highmoor Farm.

PURE LINE	2 year average	1914 yield
Maine No. 340	91.4	108.7
Maine No. 337	89.4	120.0
Maine No. 336	88.5	101.7
Maine No. 230	86.8	104.2
Maine No. 351	85.1	100.2
Maine No. 286	83.6	96.7
Maine No. 281	83.2	93.3
Maine No. 247	83.2	103.7
Maine No. 355	81.9	92.7
Maine No. 357	81.5	81.5
Maine No. 307	81.4	95.9
Maine No. 346	81.2	90.6
Maine No. 264	80.4	95.7
Maine No. 128	79.8	89.5
Maine No. 334	79.5	98.9
Average	83.7	98.2

It is seen that the average yield of these pure lines is considerably higher than any of the commercial varieties. Of course the averages are based on only two years and one of these, 1914, was a very good oat year. Yet if we compare the 1914 yields of these pure lines with the 1914 yields of the commercial varieties we see that the pure lines are distinctly higher. Out of 23 commercial varieties only one yielded above 100 bushels per acre in 1914, while six of these 15 pure lines yielded above that figure.

Line No. 340 is a particularly good variety. This is a selection from the Irish Victor. It has very stiff straw. The grain is very plump with a very small per cent. of hull. A test taken from the top of a bag showed a weight of 43 lbs. per bushel. Its average production for the two years is 91.4 bushels and for 1914, 108.7 bushels. Each of its plots this year gave a yield above 100 bushels.

Line No. 337 shows the phenomenal yield of 120 bushels in 1914. Unfortunately this yield is based on only one plot and for that reason we cannot attach very much significance to it. This line did not give a very satisfactory yield in 1913. It is probably one of those varieties which is very greatly affected by external conditions and yields very well in a good year but very poorly in a bad one. At least it must be tested further before we can speak with confidence regarding it.

These pure lines will be tested further next year. We cannot be certain of their behavior until we have a four or five year average to compare with the commercial varieties tested during the same years. It is quite possible that some of these lines will be discarded in future years. However, in offering these new varieties to the farmers of the state we believe we are offering something better than they can get in commercial varieties. At the very least they are strictly pure bred and will come true to type without showing any mixture. They further have the character of ripening very evenly. Not infrequently commercial varieties which are quite uniform in type of head and grain show great variation in the time of maturity. If such varieties are cut when the majority of plants are ripe there will be some plants still green. These green kernels spoil the appearance of the grain and likewise lower its germination and its feeding value. If all the plants are allowed to ripen some will be over-ripe and shatter very badly. These pure lines, which it will be remembered are each the descendants of a single plant, ripen very evenly. We believe that they will prove to have many other valuable characters.

We are continuing each year to select plants from various commercial varieties. Some of these new pure lines, selected in 1911 and 1912, are now ready to go into field tests. Of these we shall perhaps have something to say at some future time.

THE RELATION OF MANURE TO SOIL FERTILITY.

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The rock from which the soil was formed is the original source of the phosphoric acid and potash found in our soils. These elements of plant food were not available when in that form and rock ground to a powder would not be used for a fertilizer, as the plant food is unavailable. During the long period of time in which our soil has been formed from the solid rock, these materials have been slowly made available. By this we mean that they have been changed into a condition in which they will dissolve in the soil water, so that the plant can take and use them.

We will briefly consider the factors that make the plant food in the soil available. The soil water, especially water containing carbon dioxide, is a very important factor. This carbon dioxide is produced by the decay of organic matter in the soil and is washed down in the rainfall. Acids formed by decaying organic matter and soil bacteria are also important factors. Plant food is made available slowly and of the total supply in the soil only a small portion becomes available each year. If it all became soluble and available at one time, it would be leached out in the drainage waters, because the plants could not use it in such large amounts; hence, this provision that plant food become available slowly is Nature's method of giving permanence to our soils.

Nitrogen, probably the most important plant food element from our standpoint, was not found in the rocks from which the soil was formed, and its original source was the air, 80% of which is nitrogen. Its source, for most of our farm crops, is the organic matter in the soil, as the nitrogen in the air is unavailable for ordinary plants. The question might be asked: By what means was the nitrogen contained in the organic matter taken from the air? A small amount of this is washed down yearly in the rainfall, and soil bacteria also fix nitrogen in the soil in a form that will become available to plants. By means of these two factors, then, a supply of nitrogen was taken from the air so that plant life might begin. These two factors have kept up the nitrogen content of the soil.

Let us consider for a moment Nature's method of handling the plant food problem. Under natural conditions, plants died and decayed where they grew and were carried away only in small amounts. Thus the supply of plant food and of organic matter in the soil was kept up, and the plant food in the decaying plants was becoming available each year to supplement the original source in the soil. This produced what we might call a revolving fund of soil fertility;—that is, plant food was taken from the soil by plants which decayed, and in the course of time released this plant food for the use of other plants. It is necessary that we have an additional source of plant food, besides that made available in the soil each year by natural conditions, as such a small amount will not produce profitable crops.

Man, however, must remove the crops he grows from the soil; thus the available plant food is removed from the soil and the organic matter content of the soil cut down. Both of these must be supplied, or the productivity of the soil is reduced. The farmer may make two uses of his crops, he may sell them from the farm or feed them to the stock and return the manure to the soil. The purpose of this paper is to discuss the return of plant food to the soil in manure.

Let us here briefly look at the relation of the method of farming to the amount of plant food removed from the farm. For each one hundred dollars' worth of product sold, the value of the plant food removed from the farm will be as follows:

Butter	.08
Cream	.53
Eggs	1.77
Whole milk	4.07
Meat	4.61
Potatoes	10.53
Oats	24.48
Timothy hay	32.13
Straw	57.40
Clover hay	66.62

Average prices over a series of years were used in these calculations. Of all classes of farming we see that dairying is the least exhaustive, except in the sale of whole milk, of plant food. And if concentrates are purchased and fed, in many cases the supply of plant food in the soil may be increased.

Let us consider the reasons for the effect that the sale of different products has upon the plant food problem. Under average conditions, about 80% of the plant food in the feed is recovered in the manure,—that is 80% of the nitrogen, phosphoric acid, and potash in the feed is excreted by the animal in the manure. This amount is less in young growing animals and animals giving milk, and more in mature animals.

We can see, however, that the value of manure would depend directly upon the feed, and the man purchasing concentrates and other rich feeds can expect his animals to produce more valuable manure than the man who is feeding less concentrated feeds. However, the fact that 80% of the plant food is recovered in the manure is of more importance.

It is figured that the fertility of the soil would be kept up, if crops were all fed and the manure returned to the fields without loss. That made available yearly in the soil would make up for the twenty per cent retained in the bodies of the animals. This, of course, would not continue indefinitely, and usually the phosphoric acid would be the first element to become lacking, if such a system were followed. It is doubtful if, in a region having cool summers, manure can be depended upon entirely. The plant food in the manure must be made available by the soil factors referred to previously. These are considerably more active in summer than in the early spring.

Therefore we need some available commercial fertilizer to start the crop in the spring before conditions have become favorable for making the plant food in the soil available. This fact, however, does not mean that the manure is not valuable and that it is not worth using.

It is not my purpose to say whether the farmers should feed or sell their crops. This seems to me an economic question to be decided by the farmer for himself and its solution depends upon the profitableness of the method. Plant food can be supplied in fertilizers and if the organic matter content of the soil is kept up it will not decrease in productivity. I wish to emphasize, however, the statement that the organic matter content of the soil must be kept up, if we are to depend upon fertilizers alone.

The Pennsylvania Station has for thirty years kept up the productivity of plots on which only mineral fertilizers, phosphoric acid and potash are used. However, a four year rotation is followed, one crop of clover is grown and a heavy sod plowed under every four years. The clover apparently supplies nitrogen for the other crops, while plowing under the sod keeps up the organic matter content of the soil. We cannot say that under all conditions a crop of clover grown in this manner would supply the nitrogen needed by the other crops, but these results indicate that if organic matter is supplied, soils will not decrease in productivity when commercial fertilizers instead of manure are used.

However, most farmers keep a greater or less number of live stock, and the question for consideration is: Can we not secure better returns for the manure produced by our animals than we are doing at present? The above statements are based on the supposition that the manure is saved and returned to the fields without any loss of the fertilizing elements. In practice, from one-half to one-third of the plant food value of the manure produced in this country is lost and never reaches the field. Some of this loss is unavoidable, but much of it can be prevented.

Now we will take up the losses in manure by which it is deprived of some of the plant food excreted by the animal. We will first consider the loss of the liquid manure which may easily occur unless steps are taken to prevent it. The liquid manure contains about two-thirds of the nitrogen and four-fifths of the potash found in manure. The plant food in the liquid portion of the manure is soluble and hence is very quickly available when added to the soil. Taking this fact into consideration, we find that more than one-half the value of the manure is in the liquid portion, and if this is not saved, we are losing over one-half the value of the plant food in the manure.

To show that this loss can be measured in crop production, an experiment conducted by the New Jersey Experiment Station will be quoted. For three years, they compared an application of the solid part of the manure alone, with the solid and liquid parts together. These were added in quantities that would furnish the same amounts of nitrogen. As an average for the three years, they found that the solid part of the manure alone produced an increase of 43.9% over plots to which no manure was applied, while the solid and liquid portions of the manure produced an increase of 83%. This result shows that the liquid part of the manure has a value which can be measured in crop production. The prevention of this loss means that the floors of the stable must be water tight and that plenty of absorbents for bedding must be used to absorb the liquid portion of the manure. If there is dripping from the manure when it is moved, the farmer should realize that the most valuable part of the manure is being lost.

The loss in manure by leaching will be considered next. By this is meant the loss that occurs when the manure is thrown out doors and the rain water runs through it carrying away either on the surface of the ground or into the soil beneath the manure pile the soluble parts of the manure. This loss occurs in all the elements and means a loss of the most valuable parts. The Cornell Experiment Station conducted several experiments to determine the loss of plant food when manure was thrown into the barnyard and left in piles for some time. On an average of several experiments where the manure was left from fifty to one hundred and thirty days, 52% of the nitrogen, 50% of the phosphoric acid, and 57% of the potash originally in the manure was washed away. This plant food may simply seep into the ground beneath the manure pile and be lost while nothing will occur to call the attention of the farmer to the loss. If manure is left out in the barnyard for any length of time during rainy weather, we may expect that from one-fourth to one-half of the plant food will be lost. The Ohio Experiment Station conducted an experiment to determine the difference in crop production between manure hauled directly from the stable to the field and manure left lying in the barnyard for some time. In each case the manure was applied to the ground in a three year rotation of corn, wheat and hay. In one case the manure was hauled directly from the stable to the field about midwinter, and in the other case it was thrown out into the barnyard and left in a pile, as is the common practice with some farmers, for two or three months. It was then scattered over the corn ground in the spring. This experiment has run sixteen years now, and the increase on crops produced by the stall over the yard manure will be quoted. Stall manure produced five and one-tenth bushels more corn, one and three-tenths bushels more wheat, and practically 600 pounds more hay on an average each year. Figured by the increased crop over the plots where no manure was used, the stall manure was worth $3.30 per ton and the yard manure $2.60, making a difference of 70c per ton in the value of the stall manure as measured by the crop produced. This seems to show that there is a decided loss in manure when allowed to remain in the barnyard and that this loss can be detected by the crop. This is a question of where the leaching occurs. If it occurs in the field the plant food goes into the soil where it can be used by the crops; if it occurs in the barnyard, this plant food is a total loss, so far as crop production is concerned. The remedy for this is to prevent the leaching of manure except on the field where crops are to be grown.

The third loss in manure is by fermentation or heating. This occurs when the manure is thrown into a loose pile where it will heat, and decomposition begins. This loss falls only on the nitrogen but there is considerable loss of the organic matter content of the manure, which should be incorporated with the soil. Where the manure is so loosely piled that it heats when rotting, we may expect a loss of from 30 to 80% of the nitrogen, but no loss of phosphoric acid or potash. This loss occurs only when air has access to the manure pile. The remedy, then, is to keep the manure pile moist and compact to exclude the air. If the manure does not heat while rotting, there will not be any considerable loss of nitrogen.

Let us consider how we may care for manure to prevent these losses and secure the best results. Undoubtedly the best method so far as saving the plant food is concerned is to haul it directly to the field and spread as soon as possible after it is made.

If this is done, there is no loss by decomposition or heating. The manure spread thinly over the ground dries and decomposition will stop. The reason for this is that decomposition is brought about by bacteria and the bacteria require some moisture for their work. When the manure is thoroughly dried their work stops and there is no danger of further loss by decomposition. Any plant food leached out is carried directly into the soil beneath the manure where it is needed.

There is no loss of plant food from manure by evaporation. A general belief prevails in some parts of this country that there is such a loss when it is scattered over the field. We have experimental evidence proving that any loss from this source is very small compared with the loss when the manure is left in the barnyard or around the barn under the usual conditions. When rotting manure is stirred up, there is some loss of the ammonia that has been formed, by its escape into the air. This loss may be of importance when such manure lies on the ground for some time in pleasant weather, but a rain will wash the ammonia into the soil and application on snow would prevent loss. If the manure is plowed under soon, the soil will prevent the escape of the ammonia. This loss cannot well be prevented and will occur to some extent when rotting manure is handled.

The only source of loss that we have to fear when scattering fresh manure broadcast is surface washing. This may occur on a hillside during a freshet, or the melting of snow, but on fairly level ground, however, there is little danger of loss by this factor. There is little danger of loss by applying manure on snow on fairly level land unless the snow is of excessive depth. This loss is considerably less than we would expect, as the soil has considerable power to absorb organic substances.

The Maryland Experiment Station has done some work in comparing the use of fresh and rotted manures and the value of manure applied at different seasons of the year in crop production. They found that in practically every case fresh manure gave better returns than manure that had been allowed to rot.

Their results also indicated another more important fact,—that the earlier the manure is put on the fields, the better are the returns secured. No figures need be given, but their results showed conclusively that fall and winter applications are better than those of spring, in increasing crop production. That is, the earlier we can get the manure upon the fields after it is produced, the better returns we will have the following year.

However, there are several reasons why it might be impractical to haul to the field and spread at once. Therefore we will consider some way of storing manure to limit the loss to the lowest possible figures. The manure cellar, which may be objectionable for sanitary reasons, will be first considered. There may be considerable loss by seepage, from the manure cellar, if the liquid manure is not absorbed, and this loss may occur without the farmer's realizing it. If it is possible the floor of a manure cellar should be of impervious material to prevent loss. It is good policy where practical, to mix the manure of horses and cows when it is stored. The cold, wet cow manure prevents the horse manure from heating and they are better preserved for the mixture. It is also good practice to allow hogs to run over the manure, as they work it over and add their own wet excrement which tends to keep it moist and to prevent heating.

Another good method of preserving manure is to leave it in the stable or shed and let the animals run over it. This is practical with sheep and steers and it is practiced with dairy cows. The cows are allowed to run loose over the shed and are only taken out at milking time. The use of plenty of bedding will keep them as clean as in a stable and there is only a slight loss of plant food when manure is produced under these conditions. The animals keep it compact and moist, and if plenty of bedding is used the method is not objectionable for the animals. It might be found practical to cover a part of the barnyard and use it in this way. Manure produced in this manner can be removed at convenient times, and while accumulating will not be a detriment to the stock.

Storing manure under cover in a lean-to or small cheap shed will do very well. A water tight floor would of course increase its efficiency by preventing loss from seepage. The advantage of this plan is that the manure is kept under cover and loss by leaching is prevented. One disadvantage is that the manure may dry out and heat and thus suffer considerable loss. This is especially true of horse manure. If hogs were allowed to work it over, there would be little danger of loss on this account. Unless manure stored in this way is kept compact and moist a roof is of doubtful help. That is, there is no advantage in placing a roof over a manure pile, if we are to allow it to heat. The spout from the gutters could be fixed so that it could be turned upon the manure pile in case it began to heat, but it might be necessary to apply water sometimes to prevent all loss.

The manure pit is of considerable value in conserving manure. By this, I mean a cement pit without a roof in which the manure is placed. The advantage of this is that there is no loss by leaching, and the rain keeps the manure moist and prevents fermentation, but it may be necessary to handle an excess of water. Both of these seem to be feasible and practical plans for storing manure, if it is removed from the stable daily and yet cannot be spread out on the fields at frequent intervals. I have already shown you the loss that manure suffers from leaching. The Ohio Experiment Station compared the plant food content of manure produced by steers fed on a cement floor, and the same number fed on an earth floor. The earth floor has been used for this purpose for several years and was thoroughly tramped. The manure was allowed to accumulate under the feet of the animals and with such conditions we would expect little loss. The analyses showed that the cement floor saved 13% more of the nitrogen and 10% more of the potassium in the feed than the dirt floor. The loss was by seepage of the liquid manure into the earth floor. This loss is small and would not mean very much in crop production for any one year, but during several years it would mean the loss of a considerable amount of plant food. This simply calls attention to the necessity for taking steps to prevent this loss if we are to secure the very best possible results from manure.

There are, however, many farms where manure must be piled out of doors for a considerable length of time. Where this must be done, the manure should be placed in a high, compact pile. In most cases this can be done without much more labor than is required when it is spread over a considerable part of the barnyard, a condition which we too often see. The manure pile should be high so that the rains will not leach through it and should be compact to prevent fermentation taking place. Each addition to the manure pile should be firmly packed into place, and it should be something more than a loose heap where the manure is simply dumped to get rid of it as quickly as possible. Such a manure pile should have straight sides and the top should slope towards the center so that water will run through it rather than run off the sides and carry away plant food. Some water may leach through it but water running through it will keep it moist and this will tend to better preserve it than if the water were allowed to run off the sides. If possible, horse or sheep manure should be mixed with the more moist cow or hog manure. If such a pile is to stand for some time it should be covered with an inch or two of dirt. This will prevent the escape of any ammonia that may be formed, as the dirt will absorb the ammonia.

As a general principle it can be said that better returns are secured from manure by frequent light applications rather than by heavier ones at longer intervals. Better returns are also secured with manure the more area it is spread over; that is, if we only have manure enough to cover six acres heavily we will get better returns per ton of manure if we apply it lightly over eight or ten acres. This has been shown conclusively by experimental evidence. The heavier applications will produce larger crops, but a less gain per ton of manure. The idea is to spread the manure over as much ground as possible. The manure adds organic matter to the soil, through its decomposition makes plant food available, and improves the soil in other ways. So, then, we should scatter manure over as large an area as possible, even if it must be supplemented by commercial fertilizers. It is, of course, impossible to cover the entire farm with manure, but an effort should be made, so far as possible, to cover the land once during a rotation.

Let us consider briefly the crops to which manure can best be applied. Of all farm crops corn makes the best use of manure, and the practice of putting it on land which is to be planted to corn is very good. There is another farm crop which responds profitably to applications of manure, and that is the hay crop. During the drouth of the past summer, the increased yields brought about by a top dressing of manure the previous year were brought to my attention several times. Many authorities believe that it is better practice to apply manure to the hay land rather than to apply it directly to the corn land. The increase in the hay crop is worth while and there is considerably more organic matter to plow under later. Certainly no mistake will be made by applying manure to our hay fields, and this is especially true of fields that are kept in grass for several years. Manure is many times left around the barnyard when there is some field which would be benefited by its application.

Heavy applications of fresh manure applied directly to the potato crop are likely to make conditions favorable to potato scab. Potato land, then, should be manured lightly the fall before the crop is planted. Even if we are growing potatoes, however, there are other crops in the rotation which would be greatly benefited by the manure.

There is one point concerning the application of manure which should be brought out. In all cases, manure should be spread broadcast over the land. There is no justification of the practice of putting it in small piles in the field and spreading them. The piles leach into the ground and unevenly fertilize the field, there is danger of loss by heating and extra labor is involved. This practice developed when there was belief that manure lost its strength by being spread on the land for considerable time before plowing under. Now that we know this is not true, we have no longer any reason for leaving manure in piles.

The question of the advisability of using rotted rather than fresh manure might be brought up. Garden crops and potatoes do better with rotted manure, as it makes a more evenly balanced fertilizer. The compost heap is advisable for gardeners; for general farm crops the use of fresh manure is preferable as there is less loss of plant food and the cost of applying the manure is less. Sometimes grain crops are injured by the application of manure, but the remedy in this case is to use the manure on some other crop of the rotation. On very light soils there is sometimes injury from heavy applications of manure in the spring as the manure dries the soil so that the crop suffers. In such soils as these only light applications should be made in the spring, but there is little danger from heavy applications the preceding fall or winter. For ordinary farm conditions the use of fresh manure is preferable.

Poultry manure presents a different problem from ordinary manure and we will consider it briefly. It is high in nitrogen and very dry, so that it decomposes and loses nitrogen easily, especially during warm weather. To prevent this decomposition and absorb the ammonia formed, the fresh manure should be thoroughly mixed with some material like muck or earth. The following mixture is recommended: For ten pounds of poultry manure use four pounds of sawdust or dried muck, four pounds of acid phosphate and two pounds of kainit. The sawdust or muck acts as an absorbent and the other materials make it a more evenly balanced plant food. Even if the other materials are not added some absorbent should be mixed with manure and in many cases it would be well to scatter it over the dropping boards.

In conclusion, I would emphasize the value of manure as a fertilizer. It supplies the elements of plant food in varying forms of availability so that it has a lasting effect which is not possessed by commercial fertilizers. It also has considerable humus value, its decomposition in the soil makes plant food available and it improves the structure of the soil. We do not, and never will, keep enough live stock so that we can keep up the fertility of the soil by manure alone. This does not detract from its value nor mean that we cannot get better returns from the manure produced on our farms than we are doing at present.

Ques. How much manure would you recommend for grass land?

Ans. Eight or ten tons would be a fair application. If you had the manure to spare you could apply more and get proportional results.

Ques. What per cent of the manure is lost by seepage from the ordinary barn cellar more than if taken immediately to a tank stored under the barn?

Ans. We cannot say definitely; it would depend on the conditions,—how readily the soil absorbs moisture, how well the liquid manure is absorbed, etc.

Ques. How much would be lost if the cellar were not cemented as compared with a cemented cellar?

Ans. The only experiments I have in mind are in feeding steers on cemented and dirt floors, where a loss on the dirt floor of 10% nitrogen and 13% of potash was found.

Ques. Have there been any definite experiments to show the value of the manure applied to the land from a spreader and by hand?

Ans. As far as the application of manure is concerned, you can get better returns if you spread it over more ground, and you can spread it over more ground with a spreader than you can by hand. I think that to get as much value as possible from a ton of manure a spreader would be advisable. It seems to me that the spreader is an economical proposition with a sufficient number of live stock.

Ques. Do you recommend housing the manure in barn cellars?

Ans. It seems to me that where it is possible you can get better returns by hauling it to the fields, but the barn cellar is a very good way of storing the manure, provided the liquid manure is stored and there is not any loss by decomposition of the cow manure.

Ques. Isn't the time near by when we are not going to be allowed to use those cellars, when we are producing milk?

Ans. I think it is. The use of barn cellars for storing the manure is being prohibited in many states at present.

Ques. Did I understand you to say that half of the value of the manure is in the liquid form?

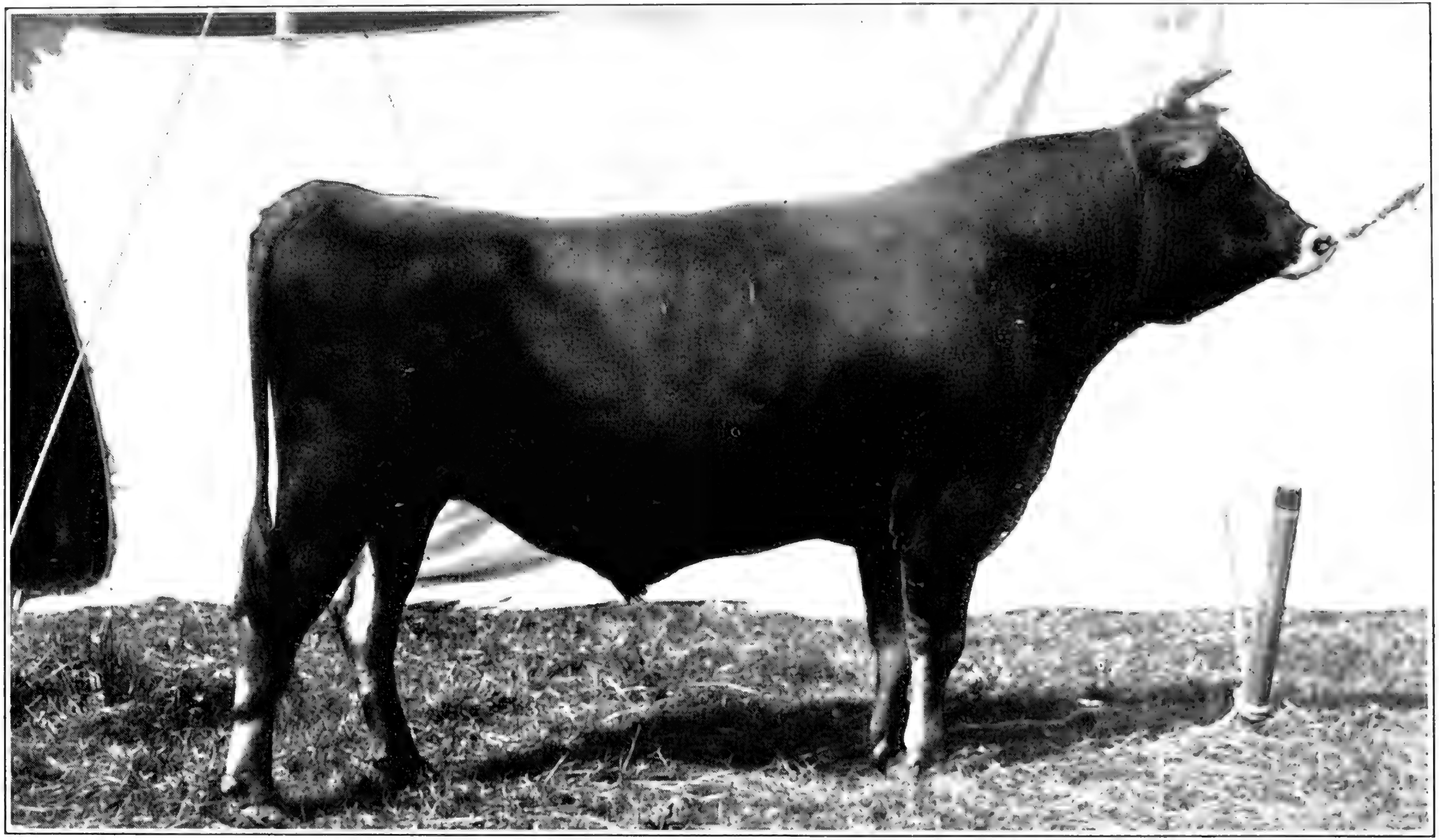
Ans. If we have ten pounds of nitrogen in manure, five pounds is in the liquid form and five pounds in the solid form. About two-thirds of the total potash is in the liquid manure. There is no phosphoric acid, or very little, in the liquid manure. That makes about half the value of the manure in the liquid.

Ques. Where acid phosphate is used to supplement the manure, what are the results?

Ans. Where that has been practiced, very good results have been obtained. This is done in the west, but the conditions there are a little different from what they are here, because in some cases they seem to need only phosphorous fertilizers, while here we need nitrogen and potash in greater quantities.

Ques. Have you carried out any experiments in the line of spreading the dressing immediately on the fields? My experience has been that there is a good deal of washing on the frozen ground in winter even when the ground is plowed in the fall.

Ans. There have not been many experiments in that line in New England. While there is some loss of plant food, yet the loss is not usually so great under those conditions as it is when stored around the barn unless there are very good conditions for storing it.



Oxford's Fairy Boy, 92821, owned by H. M. Tucker, Canton.

SUCCESSFUL CREAMERY OPERATION.

By S. C. Thompson, U. S. Department of Agriculture, Washington, D. C.

The subject which I have chosen for this occasion may give the impression that I do not consider the creameries of Maine successfully operated. On the contrary, I am sure that there are few, if any, states where the creamery as a whole is so successful as in Maine. However, conditions are constantly changing and it is necessary to introduce new methods from time to time in order to successfully meet the changing conditions. In discussing this subject I hope to enumerate some of the principles of creamery operation which are often not given sufficient consideration by creamery operators and result in the creamery failing to meet with the success which is its due. It is also true that different localities have different conditions to meet. This makes it necessary for each community to formulate in detail its own methods of operation. At the same time the general principles involved apply in practically all cases. At the present time there are more than 6000 creameries in operation in the United States. Some of them are exceptionally successful, while others are having a hard struggle to exist. Of this number more than one-third are located in the states of Wisconsin, Minnesota and Iowa, and practically all of them are located in the states north of the Mason-Dixon Line.

CLASSIFICATION OF CREAMERIES.

These creameries may be classified according to the kind of product handled, into two classes; one handling whole milk, the other handling gathered cream. The introduction and general adoption of the hand separators have resulted in decreasing the number of creameries receiving whole milk and at the present time there are probably less than 100 strictly whole-milk plants in operation. This fact alone has made necessary a complete change in the methods of operating creameries within a comparatively few years.

Creameries may also be classified according to the territory from which their supply of raw material is drawn, into two classes: Local creameries and centralizing creameries. The local creamery receives its supply from the immediate vicinity and includes practically all the whole-milk creameries and a very large percentage of the gathered-cream plants. The centralizing creameries are operated exclusively on the gathered-cream plan and usually receive their supply of raw material by rail, frequently from long distances. Some of them depend upon direct shippers while others operate cream-buying stations.

There is still another classification of creameries which may be made, namely, those owned and operated by coöperative associations and those operated by individuals or corporations. At the present time about one-third of the creameries in the country are operated on the coöperative plan. These include practically all the whole-milk creameries and some of the local gathered-cream plants. The individually owned creameries include practically all the centralizers and many of the local hand-separator plants.

The successful operation of creameries in the different classes is effected by a number of conditions, some of which are peculiar to each class, but depend principally upon the following general factors: The quantity of raw material available, the quality of raw material received, the kind of supervision given, and the efficiency of management.

THE QUANTITY OF RAW MATERIAL AVAILABLE.

The amount of raw material necessary for the successful operation of a creamery varies considerably and depends to some extent upon local conditions. Many creameries have failed because the quantity of milk and cream available was insufficient to make their operation economical. The high cost of manufacture so reduced the prices paid for butter fat that they were unsatisfactory to the producers. In such cases they withdrew their support from the creamery and found a market for their product elsewhere. Because of this condition it is essential in the establishment of creameries that the amount of raw material available be carefully determined, otherwise they may be doomed to failure from the very start. In some sections of the country, particularly in localities where dairying is undeveloped, many creameries have been started where the amount of material was insufficient for their successful operation, in the hope that they would stimulate dairying. In almost every instance such creameries have failed for the reasons given above.

A study of these conditions has led us to conclude that a creamery established in a territory where dairying is developing and where there is good prospect that the amount of milk and cream will increase from year to year, may be successfully operated on the milk and cream produced by 400 average cows, but that a smaller amount of product than this makes the successful operation of a creamery doubtful. In localities where creameries are already established and where competition will be encountered from the first, it is considered necessary that an output of at least 100,000 pounds of butter per year be assured. Investigation has shown that the cost of manufacturing butter is not much greater in a creamery making 100,000 pounds per year than it is in a creamery making 150,000 to 175,000 pounds per year, but that the cost of making butter in a creamery producing 50,000 pounds per year or less is much greater than in the plants making 100,000 pounds. In establishing new creameries it therefore appears that careful consideration should be given to the amount of material available for manufacture.

QUALITY OF RAW MATERIAL.

The quality of raw material which is necessary for the successful operation of the creamery cannot be definitely measured as long as we judge of success by comparison, but the creamery which gets a better quality of raw material than its neighbor always has a decided advantage. Dealers are becoming more and more critical and it is the fine butter that brings premiums and is in the greatest demand at the present time. During the early months of this year the range in butter prices on the principal butter markets was unusually large and many creameries which were receiving poor raw material had serious difficulty in meeting competition of the creameries where better quality was secured and it was generally predicted that creameries which could not get a reasonably good grade of milk or cream would be forced out of business. The market conditions, however, changed before any very serious damage was done, but this incident shows the importance, if not the necessity, of securing good raw material. In your state, where sweet cream is delivered in large quantities and where the quality of raw material is unusually good, you probably do not realize to what extent poor quality interferes with successful operation of creameries in other sections of the country. In centralizing creameries and in many local creameries operating on the gathered-cream plan, it is not infrequent that cream is held on the farm for a week, with no effort being made to cool or properly care for it. In one instance which was investigated, cream had been held under such conditions for at least two weeks, then hauled on a wagon for a distance of sixty miles, which required two days, and shipped by rail to the creamery. Since I have come to know more about creamery operating methods in other states, I realize that Maine creamery operators and patrons have good cause to congratulate themselves on the quality of raw material furnished to the creameries. This has resulted in eliminating one of the most perplexing problems creamery operators in other states have to contend with and has resulted in raising the price for butter fat to a point considerably higher than that paid producers of poor cream in other states.

SUPERVISION.

The value of efficient supervision is generally under-estimated. Butter makers and creamery employees are frequently hired because of their willingness to work for a small salary, but as a rule such men are the most expensive to employ. Many creameries can trace their lack of success to the low prices received for butter caused by poor workmanship. Reports from the market inspectors of the Dairy Division who were stationed in New York and Chicago show that out of 2300 different lots of butter inspected in one year, 36.6 per cent showed defective body and 13.5 per cent were mottled. Besides making a product of good quality, the butter maker of today must be able to control the water content of his butter. With the strong competition which exists, creameries find it necessary to secure a maximum amount of over-run and, as this naturally affected by the water content of the butter, many butter makers are employed on condition that they are able to incorporate a definite amount of water in the butter. While I do not wish to encourage the incorporation of a high water content in butter and believe that in many instances the quality is injured in an effort to do so, yet conditions have arisen which make it almost necessary for a creamery to have a butter maker who can control this constituent if it is to be successful. The price of butter is frequently cut two or three cents per pound because it is mottled or has defective body, and it is obvious that this cut in price is not conducive to a successful creamery. Again, when a creamery has an over-run of but 10 to 12 per cent, which often occurs, it sustains a loss of two or three cents per pound on the amount of butter made, as the following example will show: 100 pounds of butter fat with an over-run of 11 per cent produces 111 pounds of butter, which at 30 cents a pound amounts to $33.30. If an over-run of 21 per cent, which is a reasonable one, is secured, then 100 pounds of butter fat produces 121 pounds of butter, or $36.30, leaving a difference of $3.00 on each 100 pounds of butter fat, or three cents a pound. Some will say that this item is not altogether a loss, but in any event the creamery is unable to pay as much for butter fat by three cents per pound as would be the case if the higher over-run were secured.

The sanitary condition of the plant, as well as its general appearance, depends on the man in charge and, while the success of a creamery may not rest entirely upon these items for its success, yet a sanitary creamery and one of good appearance usually goes with a successful plant.

MANAGEMENT.

The management of a creamery is undoubtedly the most important factor in its successful operation and I am convinced that a large share of creamery failures could have been prevented by efficient management. To some extent management can overcome other factors affecting the success of a creamery. Small creameries are seldom able to procure a manager of proven ability because of the high salary which it is necessary to pay him, but the large creameries, including most of the centralizers, employ the very best men it is possible to obtain, some of them paying salaries of $5,000 or more a year. The duties of a creamery manager are exacting. He must, first of all, be a good business man and something of an economist. He must be able to direct the activities of the creamery in all its departments and, while it may not be possible for him to give personal attention to all the details of each department, he must select men who are capable of doing the work under his direction. The quantity and quality of raw material received depends on his ability to win the confidence of the patrons and to satisfy them in their dealings with the creamery. He must market the product in such a way as to get maximum returns. In successfully marketing the creamery products he must be familiar with market conditions in general and take advantage of every opportunity which arises to extend the sale of his product on a satisfactory basis. He must be far sighted and alert. One of his important duties is to prevent leaks and losses in the operation of the plant. He must, if possible, know the amount of butter fat received each day and what disposition is made of it. If the creamery is paying for more butter fat than is actually received, he must locate the cause and take measures to prevent its recurrence in the future. If the creamery is not getting a proper over-run or if the workmanship of the butter is bad, he must find means of correcting the trouble. He must see to it that records of the business transactions are kept in such a way that they will show at any given time the exact standing of the business. If he fails in any of these branches, the creamery will suffer in consequence. In many of our smaller creameries, and perhaps in some of the larger ones, the leaks which a competent manager would prevent result in the failure of the creamery to successfully meet competition and often drive it out of business. Investigation has shown that many creameries are careless in weighing and sampling cream, that improper care is taken of the samples, that cream haulers are not properly checked, that the loss of butter fat in skimmed-milk and buttermilk is excessive, that cream is wasted through careless handling, that insufficient operating and sales records are kept and that there is a general lack of system in the plant. Losses through any of these items will reduce the efficiency of the creamery. In plants that are properly managed such conditions are not permitted. I am convinced that a creamery manager ought to have his work so organized that the entire transactions of the day will be recorded in a report ready for the examination the following morning. This report should show the amount of milk and cream received, the amount of butter made, the amount of butter fat sold in the form of milk and cream and the amount made into butter. It should also show the water and salt content of the butter and the over-run. If butter of average fat content is made, an over-run of 21 per cent should be secured. If the over-run is materially less than this figure, there is good evidence that some of the butter fat has been lost and immediate steps should be taken to determine where it went. It is plain that a creamery cannot increase the quantity of butter fat during any of the manufacturing processes and it is well known that certain mechanical losses are bound to occur. Consequently the butter fat which finally finds its way into the finished product will be somewhat less than the amount received. The amount of this loss, however, should be kept to a minimum. On a basis of 21 per cent over-run the necessary mechanical losses have been allowed for, if the butter contains 14 per cent water and 4 per cent salt and curd. Therefore the manager will know at a glance at this report whether or not the losses have been too great. If, instead of checking the amount of over-run every day, it is not determined until the end of the month, it would not only be difficult to find the cause of the excessive loss, but the amount of the loss, if any, would be thirty times as great as it would be for one day. There are many creameries scattered throughout the country that are not keeping proper records and checking their daily operations and in consequence are losing hundreds of dollars per month.

Having had an opportunity to study these conditions and knowing that such losses are real, I cannot refrain from calling special attention to the importance of giving careful consideration to this subject. I know of several creameries that have actually gone out of business because of their failure to check up the over-run as should have been done. At the same time these creameries apparently had as good management as the average. On the other hand, I know of creameries which have increased the prices paid for butter fat as much as three cents per pound, while the butter sold for the same price.

FUEL WASTE.

The over-run is a good indication of the loss of butter fat in creameries, but there are other losses which cannot be detected in this way. In such cases the manager must depend on other means for detecting them. One source of waste in creameries which has been given too little consideration in the past is in the fuel. Special reports from creameries show that the cost of fuel per pound of butter manufactured is four times as great in some creameries as it is in others where the amount of business done and the methods employed are similar.

There are many causes for this waste, the principal among which may be enumerated as follows: The boiler and engine being of improper size or improperly installed; the furnace not suited to the fuel used; poor draft; grate area in furnace not properly porportioned; the chimney not properly proportioned; coal wasted in handling; coal lost in ashes; coal lost in incomplete combustion; heat lost in radiation; heat lost in the creamery; heat lost because of air leaks in setting and furnace; heat lost by excess air drawn through grate; heat lost by short-circuiting of gases; heat lost by soot on heating surface; heat lost by scale in boiler; heat lost by feeding cold water to boiler; heat lost by leakage of water and steam; heat lost in exhaust steam; heat lost through worn valves and piston rings; heat lost by keeping high steam pressure on boiler when not in use; heat lost in systematizing the operation of the plant. While the quantity of fuel for making one pound of butter is small we can readily see that where one-third of a cent a pound is actually wasted, which is frequently the case, the aggregate loss for a year will be an item worth considering. On this basis a creamery making 150,000 pounds of butter a year will lose $500. Mechanical engineers tell us that where exhaust steam is used for heating purposes there is practically no cost for the power used. In other words, there is practically the same amount of heat in exhaust steam as there is in live steam when it is throttled, as it usually is for heating. Consequently when heat is required it can be secured from the exhaust steam after the power has been used, just about as effectively as if taken from the boiler directly, thus providing the power without cost. The fuel problem is one which many managers may very profitably consider.

DISPOSAL OF BUTTERMILK.

Another source of waste which should perhaps receive more consideration is in the disposal of buttermilk by creameries. Reports on this subject from several hundred creameries show that many of them make no use whatever of the buttermilk produced. Others waste a portion of their product and more than 50 per cent of all the creameries reporting, admitted that they were wasting some of this valuable by-product. In one factory producing 750,000 gallons of buttermilk a year, the entire amount was run into the sewer. In this time of high living cost it seems a pity that a product containing such a large quantity of food value should be wasted when it can be made into a variety of wholesome and desirable products. An up-to-date creamery manager would find some way to turn this product into money.

EDUCATIONAL WORK AMONG PATRONS.

Besides attending to the various duties in connection with the operation of the creamery on the business side, there is a field for doing educational work which some creamery managers may enter to advantage. I have tried to show, and I trust I have been successful in pointing out the value of the quantity and quality of milk or cream delivered to the creamery. There is scarcely a creamery where personal assistance to the patrons would not materially improve the quality of the product as well as increase the quantity.

In addition to the immediate benefit to the creamery, patrons can be aided in materially increasing the production of their herds and improving their conditions in general, all of which would be beneficial to the creamery and extend the interest in dairying. Fortunately the need for improved methods is recognized by many producers. The increased cost of feed and labor makes it necessary for the dairyman, if he wishes to be financially successful, to keep only such cows as are capable of producing at a profit and to discard all others. No man can make money by keeping an ordinary cow which eats her head off every year. He must therefore select his animals carefully and with suitable foundation stock build upon it by intelligent breeding. The time for scrubs and indiscriminate breeding is past, if dairying is to succeed and maintain its present position among the most important and profitable branches of agriculture. He must also get away from the old idea that a cow is a cow which is to be fed and handled like every other cow, and learn to deal with them individually instead of collectively. Furthermore the successful dairyman must have a good idea of modern requirements in order to put the profitable methods into successful operation. Our educational institutions are furnishing instruction of this sort, but there is, I believe, an opportunity for educational work along this line by creameries, if they are in a position to do it. With all the work that has been done and with all the advancement made there are too many inferior cows kept and too much raw material delivered at our creameries. It is apparent to me that although we are making advancement, we are not securing improvement fast enough to keep pace with the demand, and that our present facilities for giving instruction along this line are insufficient to reach all the people needing assistance. To be sure the extension departments of our colleges have done excellent work through personal correspondence, lectures published, circulars and demonstrations, and the farmers' institutes are doing good work in giving practical instruction, yet there are many patrons of our creameries who have not had an opportunity, or at least have not embraced it, of being shown how they can produce better and more valuable products at a reasonable cost and make more money out of present-day dairying. I believe much can be done by our creameries to assist in this work if they will undertake the task.

THE CREAMERY'S RELATION TO THE PATRON.

The creamery represents a certain number of patrons whose interests are identical and whose success depends in a large measure upon the success of the creamery. In fact, I think it is not putting it too strongly to say that the creamery is responsible for the quality of milk produced by its patrons and for their success as dairymen. This being the case, then our creameries may be considered units made up of the farmers patronizing them. This unit is maintaining itself as far as manufacturing and selling dairy products is concerned, against the competition of other similar units, each striving to make a little better product than its neighbor and to get more money for it in order that it may pay its patrons a higher price for the milk or cream they furnish. There is a common interest in this direction and why not make the organization valuable in other directions; why not broaden the scope of the organization to include not only the manufacture and marketing of butter, milk and cream, but the assisting of the patrons to improve their dairy conditions generally in a practical way? The butter maker and creamery operator at the present time are doing considerable to instruct patrons, but there is a broader field for work than they are able to cover.

The plan I would suggest is for the creamery to employ a man to do this work; a man who will spend all his time among the patrons of the creamery, showing them where they are failing to get the best results and how to make the necessary changes. Such a man must be well trained, both practically and scientifically, besides possessing an unusual amount of tact. Such a man must, of course, be expensive, but I believe his work can be made profitable. He might properly be called a demonstrator, and must be well trained and familiar with production and manufacturing problems in dairying. He would probably first visit the patrons for the purpose of making their acquaintance and studying their conditions. On his first visit he would probably make an examination of the conditions which he finds, but if he is wise, he will make only minor suggestions and such as may be easily complied with. His first effort will probably be directed toward improving the quality of the product delivered to the factory, by improving sanitary conditions generally and by discouraging undesirable practices that may be thoughtlessly followed. He will work to secure a clean, pure milk or cream, properly cooled and protected from contaminating influences. A trained man will notice many things that the untrained, hard-working farmer overlooks, but which he will appreciate if pointed out to him in the proper way. It is necessary, however, that only one or two of the more important ideas be mentioned at one time, as too many suggestions may defeat the purpose of the work. There are very few farmers who will not receive suggestions regarding their work from a person who has shown himself to be familiar with the subject and who presents it in a practical way. By the time he has secured improved methods in handling and caring for the milk without any materially increased cost he will have secured the confidence of the patrons and shown himself to be a safe and careful leader. He can then take up matters which at first may not have appealed so keenly to the producers. It is likely that he will explain to the farmer the importance of keeping records of each individual animal in his herd and he will probably weigh and test the milk of each cow himself. This will interest the producer, because he would like to know definitely which cow is actually giving the most milk and butter fat, although it is likely that he has never taken the trouble to find out for himself. With the record of each cow's production for a certain period it will be easy to show the importance of complete individual records.

He will then probably discuss the methods of feeding, the importance of feeding a proper ration, and perhaps prepare a balanced ration for part or all the animals in the herd. He will also compute the costs of the food consumed by each cow and compare this with the value of the milk produced. This should lead to the establishment of a cow-testing association in the community. It will sooner or later be found that the only way to secure the necessary number of desirable cows is to breed them. Here again the instructor will have an opportunity to assist in the selection of cows from which to breed. He will also help in the selection of a sire, and by this time the scrub bull will be no longer desired. When patrons understand the need of better cows and find a reasonably sure way of getting them by breeding, they are sure to become more interested in all branches of their business and it would be strange indeed if they did not seek the advice of the demonstrator in the matter of securing cheaper feeds. Many will decide that a silo is necessary in order to provide succulent feed for winter. The demonstrator will be familiar with the various kinds of silos on the market and be prepared to assist the patrons in their selection. He will also probably supervise its construction in order to prevent mistakes being made which might interfere with its success. When several patrons become interested in the proper selection, breeding, feeding and handling of their animals, other patrons who failed at first to enthuse over the proposition will see the benefits resulting from such work and then realize that they are losing valuable assistance which might be theirs for asking. When producers become interested in the problems already referred to they will do considerable thinking for themselves. They will soon realize that high class animals must be kept in better stables and it is likely that barns will be remodeled and perhaps new ones built and other improvements made. In this work the demonstrator can again make his services valuable. He can prepare plans which will provide for proper light and ventilation, also comfortable quarters for cows and the necessary provisions for keeping them clean. There may be many other ways in which his services could be profitably used and, if his plans are practical and successful from a financial standpoint, the creamery and the community will find his services indispensable.

The successful operation of the creamery does not depend alone on its ability to meet competition and to pay prices which are satisfactory to the patrons; it also depends upon its ability to make dairying profitable in the community and to develop a class of dairymen who are interested and successful and who owe their success in a large measure to the efforts of the creamery.

WHICH IS MORE PROFITABLE, FEEDING OR SELLING SKIM-MILK?

By W. C. STETSON, Waterville.

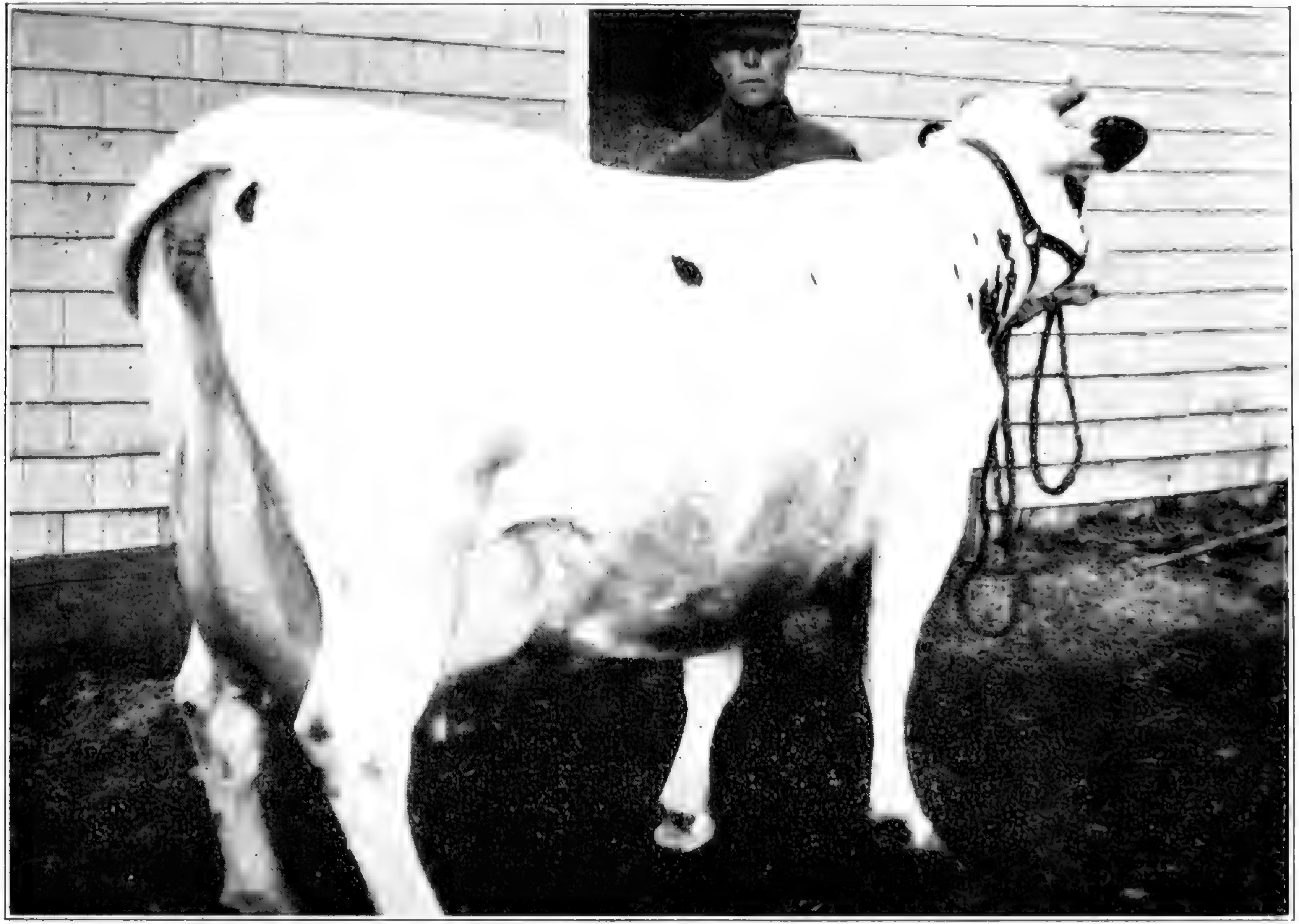
This question is one of great importance to dairymen because of the prevalent custom of feeding skim-milk to heifers to raise cows and also to some extent veal calves, and also swine. Conversely, because there is a growing demand for whole milk not only on the part of milk dealers, but also by at least one creamery company. I refer to the Turner Center Dairying Association which, the last two years, has offered special tonnage rates during the last fall months.

To sell or not to sell, that is the question. The monthly average of tonnage rate for the last full year was 35c per 100 barrels. The rate for ten months of this year is 38c. There should be deducted from this the expense of transportation, which, if sent by trolley, would be 15c per cwt., or if hauled by team, probably not less than 25c per cwt., making the net receipt last year 20c, and the last ten months to the first of November, 23c per cwt., while on the other hand, there might be a slight additional labor expense in feeding. This would be only a small fraction of the cost of transportation, however, and would itself be partly offset by the value of the manure which is probably not far from $2.50 per ton of milk. Dr. Woods says that $4.00 worth of fertilizer is sold in $100 worth of skim-milk.

But I shall try to show that the feeding of skim-milk is more profitable than selling, even ignoring the cost of transportation of the milk itself and also that of the feed brought to take its place, whether for calves or swine.

First, in respect to its money value as compared with grain feeds that might be fed as substitutes.

Secondly, as to growth actually accomplished by this feed in comparison with grain substitutes, especially for calves.



Lady Shepard De Kol. 31.6 lbs. butter in seven days.
Owned by C. L. Pike, Lubec.

Thirdly, as to the fact that the best is none too good for the raising of dairy cows, regardless of cost.

The first element in milk that makes it especially valuable as a feed is protein of which it contains a little more than 3%, variously estimated 3.1 to 3.4 or 5. This is composed of something near 3% casein and around one-half of 1% albumin. The nutritive ratio is very narrow, being 1.2. Only a good quality of cottonseed meal approximates it. Milk solids are 98% digestible, the protein itself being 95% digestible. The value of the digestible protein in milk, either whole or skimmed (which differs but little), in comparison to oats for instance, both of which the dairy farmer raises, both also seeming to have some element of feeding value which escapes the chemist's crucible, may be measured in money value something like this: A bushel of oats is practically one-third of one hundred pounds. The protein content of skim-milk is practically one-third of that of oats, pound for pound. Therefore, the protein content of one hundred pounds of skim-milk would be equal to the protein content of one bushel of oats. Valued by the protein content alone, one hundred pounds of skim-milk would at present be worth 65c and would have averaged better than 55c for the year. While, if compared in the same way with corn meal, which is admittedly low in protein, and still one of the best grain feeds we have, if not the best, and which contains a small fraction more than twice as much protein, it would be worth more than 80c per hundred (skim milk 3.1%, corn meal 6.3%), a hundred pounds of corn meal being worth $1.65, one-half 82½c.

In comparison to bran, which has around 12% digestible protein, it would be worth 37½c per hundred or ¼ of $1.50—not far from the average price for the year.

ASH.

A second element of milk that makes it a valuable feed is ash, of which one hundred pounds contains a little more than half a pound, viz., phosphoric acid 0.20 lb., lime 0.17 lb., potash 0.17 lb., magnesia 0.02.

Quoting from Henry: "Because of the protein and ash it carries, skim-milk is of high value in building the muscles and bony frame work of young animals."

"The ash of feeding stuffs is of greatest importance to animals." This is shown by feeding them rations freed as far as possible from the mineral elements, when they will, sooner or later, die of mineral starvation.

Howell states that the mineral salts of the body direct its metabolism, though in what manner is not known.

MILK SUGAR.

Milk contains a third element which makes it especially desirable and efficient as a food for the animals; namely, sugar, of which it contains around 20% or five pounds in a hundred. It may be questioned as to whether sufficient consideration has been given to its dietetic effects upon the animal, whether calf or pig. Concerning the value of sugar in the diet, Dr. Woods Hutchinson, writing concerning "What the Soldier Eats," under the caption, "Feeding a Million Men," in the Saturday Evening Post of November 7, 1914, after speaking of adding fresh beef or mutton to the army ration, says: "This made a great improvement, but there was something still lacking. It was found that on a diet of simple bread, meat and fat, a craving for other foods developed to such a degree as to impair the health."

"This craving was found to be particularly keen for sweets of all sorts; and as soon as the new-found luxury, sugar, became cheap enough to be available for army supplies, it was tested out with fear and trembling, and found to be not merely free from danger, but an extremely wholesome, digestible and readily assimilable food, and it was added to the army ration."

"The army ration has given the finishing blow to our ancient nursery superstition about the unwholesomeness of sugar and the way it makes our teeth decay, and our livers become enlarged, and our joints inflamed with gout and rheumatism, and our kidneys 'Brightsy.' It is one of the best, most readily digestible and, at present prices, cheapest forms of body fuel we have. Three-quarters of the work of the body is probably done by burning sugar in the cells of our muscles, which latter turn it into alcohol and explode it in much the same way that gasoline vapor is exploded in the cylinders of an automobile,—only the cylinders are so innumerable and so tiny that we do not hear any chugging and do not get the familiar smell. This brings the army ration or fuel supply of the fighting machine down to practically an irreducible minimum of five main type-fuels, lacking any one of which disease and breakdown are certain—bread, beef, fat, sugar, and other fruit juice or vegetables."

Again Dr. Woods Hutchinson speaks of "bread, beef and sugar," as the dietetic trinity, also again, he speaks of "bread, meat and sugar" as the "three great staples." Thus very recently the army food experts have discovered that sugar is a very necessary article of diet, what good old Dame Nature discovered thousands of years ago (if not millions), having provided in the lacteal fluid which is the natural food of the young of all warm blooded species, both animal and human, this element to an equal amount, practically, with any other constituent, not excepting the nitrogenous. The makers of baby food understand this, though makers of calf meal substitutes for milk, do not seem to have discovered the fact. (As an instance, the substitute ration for skim-milk used by the Indiana Experiment Station in feeding the three calves exhibited at the National Dairy Show in Chicago a few weeks since, side by side with three others which were fed skim-milk, as the main part of the diet, consisted of hominy meal, blood meal, linseed oil meal and red dog flour), and even Henry, in his "Feeds and Feeding," dismisses the subject with the statement that sugar as a feed has the value of starch. If this is so why not feed the army on potatoes? Or why shouldn't wheat bread suffice? Or what is the matter with good corn meal? Isn't sugar nearer the end of the process of digestion than starch, since starch, which is a more complex chemical compound, must be converted into sugar, by the enzyme ptyalin, an element of the saliva? Therefore, the process of digesting and assimilating starch consumes more food fuels than the process of digesting and assimilating sugar(?).

MILK SUBSTITUTES FOR CALF FEEDING.

Large claims are made for substitutes for milk for feeding calves, such as Blatchford's Calf Meal, and others. It is a fact that calves can be raised more or less successfully on these substitutes. But it is yet a question with many, as to whether these substitutes will grow as good heifer calves, which will make as good cows as to feed a sufficient quantity of whole milk, substituted later by skim-milk.

At the National Dairy show, as reported in Hoard's Dairyman, the Indiana Experiment Station showed six calves which had been used in its experiments in using milk substitutes for calf feeding. "These calves were Jerseys of approximately the same ages, conformation and appearance. The exhibit was effective in showing two important things: First, that skim-milk will produce the best and most economical gains (the difference in gain being 19 pounds and the difference in cost being in favor of skim-milk). Second, that where skim-milk is not available calves will make good gains when properly fed on grain substitutes. It must be remembered that these calves were given the best of care, and were under the constant inspection of an expert feeder." It is to be observed, however, that whole milk was used to the amount of 228 pounds; nearly, if not quite, enough to keep a Jersey calf in thrifty condition for one month, at an expense above $4.50 at the wholesale price of milk. After a month it is not so difficult to furnish substitutes for milk. The best feeders usually feed whole milk for a month, and then gradually work on to skim-milk.

A point of interest to be noted later, as these calves come to milk, will be to observe whether or not the retarding, apparently due to the substitute ration, continues so as to affect the final body weight of these animals or the production they attain at maturity.

A. E. Hodges, of the Waterville Dairy Improvement Association, a rising breeder of pure blood stock, says that he raised six heifers on skim-milk, and six on milk substitutes at about the same time. As mature cows, those raised on milk substitutes were about two-thirds as large as the others, and their milk products were commensurate with their size.

A Jersey breeder in Illinois, in Hoard's Dairyman of recent date, says that one can't raise pure blood Jersey calves successfully without skim-milk.

F. S. Adams is quoted in the Kennebec Journal as saying that in the National Dairy Show the skim-milk calves led.

I, myself, have had some experience in attempting to raise calves on milk substitutes. The first one was a scrub heifer calf, which kept alive about two months, without growing much.

We sold her to a neighbor at the price of a three days' old calf. He fed her on skim-milk and she improved very fast. We have now yearling and two-year-old heifers, some of which had plenty of skim-milk for the first six months, and others were cut off at two or three months, because we didn't have it. The difference in size is very apparent, even to a superficial observer (and it almost makes me groan every time I look at them). One pure blood Holstein, and one pure blood Jersey, both dropped in September, 1912, were fed skim-milk for three months, thriving nicely, the Jersey growing to be nearly as large as the Holstein at the end of three months. At that time other calves came along and took the skim-milk, so that they were cut off. One of these, a pure blood Jersey, from a very much smaller cow, and smaller strain, being fed skim-milk six months or more, is very much larger than the Jersey above mentioned. The Holstein is not as large as she would have been had she had skim-milk. I might instance calves that I am now feeding, sometimes with skim-milk and sometimes with grain.

SWINE AND SKIM-MILK.

The speaker does not take the same personal interest in feeding swine as in feeding calves, but feels at sea if milk is lacking when feeding young pigs. This may be partly accounted for by the sentiment that it is the natural food for young animals. However, it appears to be a fact that it is also a profitable and economical feed, producing results in growth of carcass and vigor that are commensurate with the cost. I have quoted freely from Henry whom I have closely followed.

A deduction by Henry from 19 experiments in feeding 88 pigs is, that 327 pounds of skim-milk will save 100 pounds of corn meal, when fed in the ratio of one pound of meal and three pounds of milk. This would make the present value of skim-milk about fifty cents per hundred.

By a rule deducted by Henry from experiments with all ages of pigs at the Wisconsin Station, when corn is worth 90c per bushel, skim-milk when fed with grain, not more than three pounds to one of grain, is worth 48c and a fraction.

Hoard's rule of multiplying the market price of hogs by five if fed alone, or by six if fed in combination with corn or barley, would make the value of 100 pounds of skim-milk with corn 51c ($8\frac{1}{2}$ x 6).

The Gurler rule proposed many years ago is: "The value of 100 pounds skim-milk when fed to fattening hogs is half the price of corn per bushel." That would make its value to us at present 45c per 100 pounds for fattening hogs.

A dairyman in Illinois who feeds his skim-milk to hogs claims to have made his milk pay 38c per cwt. fed with corn at 80c per bushel.

GEORGE JONES' PIG FEEDING EXPERIMENT.

April 12, 1913: Pigs 32 days old worth $3.00. During the month ending May 12, and each succeeding month, fed as follows:

	Skim-milk		Middlings	Worth
May 12	210 lbs.		19 lbs.	$ .29
June 12	310 "		46 "	.69
July 12	360 "		60 "	.90
Aug. 12	300 "	Hominy	75 "	1.05
Sept. 12	240 "		45 "	1.30
Total	1420 "			$4.23

Sold Sept. 10th @ $8\frac{1}{2}$c, wt. 176 lbs., $14.96.

$14.96 — (4.23 + 3.00) = 7.73 ÷ 1420 = .54 31-71 per hundred.

This experiment makes no account of labor, manure, etc., which, in general, is treated elsewhere. Mr. Jones' experiment as to result agrees very closely with experiments on a larger scale.

Henry says, in regard to his conclusions concerning feeding skim-milk to swine: "Those familiar with this feeding stuff and its worth for bone and muscle building know that in many cases, especially for young pigs and brood sows, its value is much higher than stated."

I have a notion that what my son said concerning his care of a pure blood Holstein heifer calf ought to be true of every breeder: "That calf has not been neglected one day since she was born."

It will cost more to give the best care. It may cost more to give the best feed, but such cows as these methods will raise will be both large and economical producers, provided you have a good individual to start with.

It is little short of crime to raise dairy animals as they are being raised to a large extent by the average farmer.

To conclude, let me quote again from Henry:

"While great care and good judgment are necessary in feeding skim-milk to calves, it serves its highest purpose when so used."

MARKETS AND MARKETING.

Outline of remarks of John C. Orcutt, Boston, Mass.

I. *Introduction.*

Before becoming connected with the Boston Chamber of Commerce as Secretary of that organization's Committee on Agriculture some two years ago, I was actually engaged in farming in Windsor county, Vermont, where I had considerable experience, not only in the producing of farm products, but in the selling of milk, cream, butter, eggs, hay and potatoes in the smaller towns in the southern part of Vermont and in the Boston market. I am somewhat familiar, therefore, with many of the difficulties that a producer has to run up against. The Committee on Agriculture of the Boston Chamber of Commerce has as its policy, to help New England agriculture in practical ways where it can be of assistance and not duplicate the work of any existing agency. Our particular province seems to be the coördinating of the work of the various state and private agencies already in existence and giving especial attention to the marketing end.

For the past two years I have tried to become familiar with some of the practices in the distribution of food products, and with representatives of the so-called "commission houses." I do not feel that I am competent to discuss the situation from all its phases as an expert, but will tell you something of the market conditions as I have seen them. I have planned to talk for about half an hour on the general subject, and then will be glad to answer any questions which you may have in mind, as I came here to learn some of your problems as well as to tell you of some of the conditions in the market so that we, in working together, can perhaps bring out light which will guide us towards planning more efficient ways than are in force at present.

II. *The Farmer is a Manufacturer.*

Not such a long time ago, only about fifty years, the farmer produced on his farm all his food, clothes and other articles for living, selling perhaps a little surplus and buying practically nothing, so his home and business were directly connected and so tied up that accounting was not necessary and therefore no accounts were kept.

Today conditions have so changed that the farmer generally produces one to five different products for sale, and buys the clothes for himself and family, and many of the food products.

The farmer must therefore depend more and more upon the sale of these one to five products for his cash income, and must know as nearly as possible what it costs to produce these articles in order that he may know when he is making or losing money. The amount he is able to make on these products is the amount he will have to spend for what we call "necessities" today, but which, years ago, were considered luxuries.

III. *Manufacturer should know the consumer's wants. The market and ways of marketing.*

The most successful manufacturer of any line of business constantly studies the changes in the mode of living, the wants of the consumer, where the markets are, how products are best sold, and the best way of distribution.

We may take for example the large manufacturers of Meriden, Connecticut, who have been manufacturing for years out of silver and silver plate. These people have constantly had to change the articles which they manufactured in order to keep up with the public demands. At the present time a large part of their industry is the manufacturing of plated articles which can be used for cooking by electricity. The manufacturer of flatirons who has stuck to the manufacture of the old fashioned flatirons is not making the money that his competitor is, who is not only manufacturing the old fashioned kind for a certain demand, but the electric and gas irons for the more modern demand. The manufacturers of cotton and woolen goods are constantly having to change the designs of their cloth and the weave to suit the changed demands of the trade.

IV. *Marketing Food Products.*

In considering the marketing of food products let us first consider the following:

A. The available markets.
B. Change in mode of living of consumer.
C. Change in transportation facilities.

A. The Available Markets.

The available markets are the small and large towns, and second, the large cities. The methods of marketing that prevail in the small and large towns where the nearby producer can get in direct touch with the consumer—that is, bringing in his own milk, cream, butter, eggs, potatoes, etc., directly from the farm to the cellar of the consumer, are much different from those which must necessarily be practiced in the large cities where it is practically impossible for the producer to get directly in touch with the consumer. The work of distributing the food products for them is done by several agencies, of which I will speak later.

B. The Changes in the Mode of Living of the Consumer, Especially of the Majority of People in the Large Cities.

As each year goes by, a larger percentage of the people eat at hotels, restaurants, cafeterias, etc. The great working population of any city always secures one meal away from home, and quite a percentage of those who live at home have two meals outside. This means that a large percentage of the food supply is furnished by these hotels, restaurants, etc., and a smaller amount is purchased by the home people and therefore the home people do not become familiar with the different food products and the efficient ways of marketing, this being a small part of their concern.

(1) The average consumer has no storage facilities and is not much given to buying in large quantities, so their habit has been to buy in small quantities for daily use, and the corner grocery store serves as the refrigerator, pantry and cellar for the average consumer.

(2) With the corner grocery stores and markets furnishing these facilities, the consumer has become more and more accustomed to want a variety of products and only a small amount of each kind. For instance, the average consumer does not wish to buy a barrel of apples even if he has a chance. The consumer generally buys half a peck of Baldwins for cooking purposes, and half a peck of Gravensteins or McIntosh Reds for eating. Some members of the family like this kind, and request that their wants be filled, while in the country towns it is customary to buy a couple barrels of Baldwins and a couple barrels of Greenings, and if members of the family do not like them, they go without.

(3) The consumer is constantly looking for products which require less cooking preparation and consequently less work, even if this is more costly.

C. Changes in Transportation Facilities.

The large food producing centers are now directly connected with the large consuming centers. This change has only been brought about in the last few years. We are now receiving butter in Boston from Siberia, New Zealand, Australia, South America and our Middle West, while three or four years ago it would have been considered practically impossible to bring butter across the Equator, but refrigerator ships and refrigerator cars have already changed this. Ten years ago it would have been considered an impossibility to bring whole milk or cream more than 100 miles; now it is brought anywhere from 100 to 400 miles, the majority coming from 250 to 400 miles away. The same is true of eggs. We are receiving large amounts of eggs from China that have been broken before shipment, and the whites and the yolks have been separated and put in hogsheads or cans, and shipped for consumption with our large bakers, hotels, etc. Vegetable products are also being shipped from all parts of the world. There is in the market at the present time, cauliflower coming from California and Belgium. The transportation facilities have so improved and the charge per unit on the articles sold is so small, especially on ocean carriage, that the product of any large producing center is now going to the consuming center that will pay the most money for it, so that this article that is sold on the general market has, so to speak, competition with the world's producing sections in the world's market, while heretofore certain sections have had a monopoly of producing certain articles on account of their nearness to certain markets and the lack of adequate transportation from other producing centers.

V. *The Distinct business of selling and distributing.*

A. The position of the middleman.
B. Building up the trade—increasing it.

A. The Position of the Middleman.

Sometimes I think there is a misconception of the middleman. He is a distributor of food products the same as the country store keeper is the distributor of products in a community which the people desire and demand. The commission man or distributor has his expenses fifty-two weeks in the year. He is not necessarily particularly interested in what he handles. It is the amount he can handle during the fifty-two weeks in the year and the profit which he can make which interests him, the same as in any other line of business, so he has to plan to keep handling the products as they come in season. Looking at it from this view point, he is not particularly interested in the products he handles, or where they come from; it is the quality, the quantity and the amount he can dispose of at a profit, which interests him. The amount which the farmer receives for his product depends, to a great extent, on how much of the work he, as the manufacturer, does in getting his product ready for the market. Let us, for instance, take a few examples of the many different ways of doing business. If eggs are collected by a collector and then shipped to a large commission house which grades these eggs and in turn distributes them to a retail grocer or a hotel or restaurant, the farmer receives less than if he graded his own eggs and shipped through a local association, or shipped direct to a large commission house. The same applies to milk, cream, butter, potatoes, etc. There is a certain amount of work which must be done in the distribution of food, as well as any other manufactured product. The man who does the most work is going to get the most money out of it. Now if a man collects an article like milk, for instance, furnishes the containers, transports, pasteurizes and bottles it, finds a market, collects the money and returns it, he is doing more of the operation than the man who produces it. He takes the risk all along the line and takes care of the surplus. Now if the farmer, who is the manufacturer, does part of this service himself, getting it ready for market and getting it graded, he consequently can get much more out of the article than by the other way. However, this work *must* be done in distributing food in large cities.

B. Building Up the Trade—Increasing It.

The most valuable adjunct in distributing food products is the building up of a trade,—understanding the wants of the consumer, how to serve him at the time he wants it, and also how to increase the demand for the particular article which you are handling. This necessitates having an organized force, specialists in their line, hard at work fifty-two weeks in the year building up the trade and cutting down the expense per article, which is where the profit comes in.

VI. *Suggestions for the consideration of the manufacturing farmer.*

Considering the farmer as a manufacturer, his land is his plant. Now is it not a question of what he can do with this land, or rather what we together as a group of farmers in any one community can do with our land, over a series of years to make the most profit? There is no business today into which sentiment enters as much as in farming. The business man would view his plant as a money-making enterprise and would plan to do whatever he could with his establishment that would bring him the most profit. The same thing applies to a farm. It is not necessary that we should keep all cows, or raise all potatoes, or all of any one kind of anything, just because we have for the last generation, providing conditions in the market and the distance of the community do not make it advisable at present. Is it not the task of every community, which is made up of individuals, to consider, to thoroughly analyze, what the present conditions are, what markets are available, and the condition of their land, and then decide the question, "What can we produce that will bring us more and more profit?"

Now the farmer is not necessarily ignorant or in a rut as it has been charged many times. He is just as bright as the average business man, only in this changed state of the ways of doing business which I have outlined above, he has been at a disadvantage in not possessing up-to-date information as to how it is done, on account of the fact that he has been a long distance from the centers where these methods have been constantly changing, and that he does not have time individually to visit these centers and make a thorough examination. He must attend to the producing business on his own farm. In some sections the producers have recognized this and organized themselves into an association for the selling of their produce, and have employed men who have had for their business the selling of the particular articles manufactured by the farmer in that community. There are splendid agencies to assist the farmers and none are better than those you have right here in Maine. You have the State Department of Agriculture, the Agricultural College with its Extension Service, and the County Demonstrators, all willing and eager to help you in solving the problems of your production, and help you in the problems of marketing; but before they can do anything, it is necessary that the farmers take an active interest in the matter themselves. Too long have the farmers said, "Let the other fellow do it," not realizing that they themselves are the "other fellow." Now the problem is to get these "other fellows" all together, then with the agencies at hand, you may be able to understand how to produce better quality, greater variety, at a less cost, and how to organize for the selling and distribution of produce, which is an absolutely distinct business in itself, as a man who is an expert in producing may not be an expert in selling.

Again I want to speak of the success of one of your apple selling associations right here in Maine, the Oxford Bears' Association. This Association, in coöperation with your State Department of Agriculture and Agricultural College, have produced a mighty fine grade of apples. Then by organization and by having a sales manager and having something definite to sell, have marketed to much more advantage than the general producer. The same thing will apply to any other article.

VII. *Conclusion.*

I have endeavored to state briefly some of the changes that have been going on in the marketing centers, and some of the problems which we have to encounter. Now I also want to say that your agencies in Maine are as alive to the situation as anywhere in the country, but it takes much patience and time to perfect these selling organizations which you positively must have to get the most out of your article, and certain work can be done by the producer. When he has his article graded and has something to sell, he can get much more for it than in the general way of today, whereby it is collected by the various buyers. In the first place, the producers and their organizations and leaders must get in touch with the markets and existing conditions and the wants of the consumer. I am sure that the Committee on Agriculture of the Boston Chamber of Commerce will be very glad to render any assistance it can in helping out the producers and their representatives. If any of you come to Boston and will let us know in advance, I shall be glad to take you through the marketing district and introduce you to some of the buyers and also to the cold storage people.

Now I wonder if any of you have specific problems which you would like to ask questions about and if so, do not hesitate to bring them forward, for it is only by the free and frank discussion of these problems that we are able to get anywhere. If I am not able to give you the desired information I will frankly say so, or will tell you where I believe it can be obtained. Let us have a little conference now and see if we cannot discuss to our mutual advantage, every form of the problems which are at hand.

MR. HUDSON: We raise quite a good many cauliflowers, and four years ago the express charges to Boston were eight cents a hundred. After a while we got them down to seven cents, but now they have gone back to eight cents a hundred and the prices in Boston will not much more than pay for that. It really seems that we ought to get cheaper transportation.

MR. ORCUTT: Have you taken that up with the Express Company?

MR. HUDSON: Not this year; I did last year.

MR. ORCUTT: I do not know whether the Interstate Commerce Commission has approved of the change in rates for which the express companies made application. If these rates were approved by the Interstate Commerce Commission, I doubt if anything could be done to change them unless there was a concerted demand by a large number of producers. The railroad companies file tariffs for increase in rates or changes in service. These are posted by the Public Service Commission of each state and if no one objects they go into effect by the approval of the Interstate Commerce Commission. If some one does object they call for a hearing and the case is heard by one of the deputy commissioners, and then they decide to approve or disapprove of the increase in rates. If you will write me I will be very glad to have our transportation agent take up that matter and see if anything can be done.

Ques. How can we find out that such notices have been posted by the Commission you spoke of so that before the matter comes to the Interstate Commerce Commission we could enter a protest?

Ans. These protests are before the Public Service Commission. It is the Public Utilities Commission in this state. The notices would be posted in or outside the office of the Public Utilities Commission. Generally the people who are interested go around to the Public Service Commission once in a couple of weeks or once a month, to see what has been posted ahead. That is for the local states. The Interstate Commerce Commission issues a bulletin and I think if you write to the commission your name could be placed on its mailing list. This bulletin schedules the cases which come to it. It may be true that the Interstate Commerce Commission compelled the express companies to change their rates, as the companies claim, but it probably was on the application of shippers, and on account of a readjustment, increasing in some sections and decreasing in others. Some shippers probably made application for a decrease, stating that the rates were excessive and a readjustment was made. But generally the application to the Commission comes from the companies.

Ques. In Vermont they have what they call a baggage rate. I have been for six years trying to get a baggage rate on the

Maine Central but have not succeeded. If they can get it in that section why cannot we have it in Maine?

Ans. The only way to get anything is to get right after it. If there is a demand for the shipment of certain articles by baggage service, that should be brought before the Passenger Department of the railroad over which you wish to operate. I should first consult with the Public Service Commission and get its opinion and advice as to how to get at it. Then if there is demand enough among the people I believe the railroad would grant it of its own free will. If it will not, I am very sure that if there is much demand the Public Utilities Commission would decree that it should do it. I think the question would be, How much service is going over the road? Of course you cannot guarantee what is going; all you can guarantee is the demand. If you can get a better rate, that will bring out the goods. The question of rates is a great problem. It has been discussed all over the country for a long time. It is almost impossible to get an equitable shipping rate. The railroad goes on the principle that it cannot furnish service unless that service compensates it for what it costs; although of course the road takes into consideration that it can afford to lose money for a certain time provided there will be enough increase to make up for the loss at first. That must be considered in a large business of any kind.

One more point on the selling. I am glad that you are taking up that question here in Maine. Let us take one example. Down in your exhibition hall you have an exhibition of some very nice products and on the other side of the hall there is an exhibition by various dealers of their products. They are down here by their representatives to get in touch with your people who presumably want to buy some of their goods. This thing must be turned around. You must get somebody in touch with the products you have on the table, and I don't believe this will ever be done without a big selling organization made up of little organizations so that you can put a man on the market who knows how to sell. Another success of the Oxford Bears is in getting their apples on to the railroad the same as the western apples. The problem of getting that trade is an art in itself. I have seen some associations that have been loth to pay a man a large amount of money. If a man can earn $5,000 let him do it, but first he has got to know what he has to sell; and you must have enough products so that when the expense of the organization is divided, the cost is very small per bushel or box of apples or ton of hay. The same selling organization will take care of large amounts of products. If you have something to sell you will find there is a buyer. The way is to create a market for more products than you have, and then you can raise the price. I want to give you some examples of some marketing right here in Maine. I know a man who sends eggs to a large commission firm in Boston and it returns to him 50 cents a dozen and over. I also know of other eggs coming from the very same town that return the farmer 28 cents a dozen. The man who gets 50 or 52 cents has been sending eggs for 32 years. Every single egg is marked. There are no eggs over four days old. He has a special fancy trade that calls for those eggs. In the other case, the man has been sending a case of eggs a week. Sometimes they are pretty good eggs but once in a while a hen steals her nest, and once in a while a nest egg gets in. The commission man has to candle the eggs; it is a bother and he does not like to attend to it. He would rather take eggs graded from a western association.

There is a very successful egg gathering corporation on Prince Edward Island and it has been getting very good prices from the commission houses. The main thing is to keep in touch with the commission men and market them at the right time. For instance, suppose a man in Maine has 100 barrels of apples in his cellar. He writes to a reliable commission house and says, "I have 100 barrels of apples, 50 Baldwins and 50 Greenings, fairly well colored. I would like to get the money out of these by such a date. When shall I ship them?" If that man selects a good house he is going to get from 10 to 30 per cent more than a large majority who will pack up and ship their apples and write to the commission man, "I am sending you 100 barrels of apples. Kindly return me the highest market price." In the latter case the commission man gets the letter and he gets a telephone message that the apples are at the station. He has to send a man over there and open those barrels of apples and that takes time, and time is money. He puts the apples on the sidewalk and perhaps sells them to the first man who comes along and he has to charge as much as though he were handling a lot. In the first instance the commission man knew he was going to have just so many kinds and grades of apples, and so he could look out for the trade and advise the farmer by wire when to ship. If you are not going to sell through coöperative associations, I think you should by all means go to the city and connect yourself with one good commission house. There are just as many good commission houses as there are good farmers, and there are just as many dishonest ones as dishonest farmers. What fertilizer company would ship you a car of grain without looking you up? Hundreds of farmers ship products to the markets, considering that everybody is honest, and get fleeced. Every farmer who keeps a checking account with some bank or Trust Company, can go to his bank and say, I am going to ship chickens or apples or potatoes to such a firm in Boston, and the bank will look them up. Each bank in the country has its corresponding city bank, and through this bank can find out the standing of any firm, as the bank can call the police station and if a commission house is in hot water all the time you can make up your mind there is something the matter with them. The complaints will be recorded in the police station. Or the information can be obtained by writing the Chamber of Commerce or the Fruit and Produce Exchange. You probably receive circulars from commission men stating that they will give you so much more than others, but nobody ever heard of them beforehand. They get a big shipment in one city and then go to another. A lot of people are anxious to give up their money to somebody; but if you use good business principles, you can find out beforehand whether a firm is reliable. I appreciate the fact that every farmer cannot go to Boston, but it is almost necessary for somebody to go to Boston and if any of you do come down I will be very glad to give you a list or introduce you to reliable people who are dealing in the goods you have to sell. There are business houses who have been handling certain farmers' apples for 35 years. One commission house has handled over 350 farmers' apples for more than 30 years. A good commission house is anxious to handle your product and will advise you how to put it up and what to do. But when possible I think you should take hold with your agencies and farmers' associations and sell your products through them.

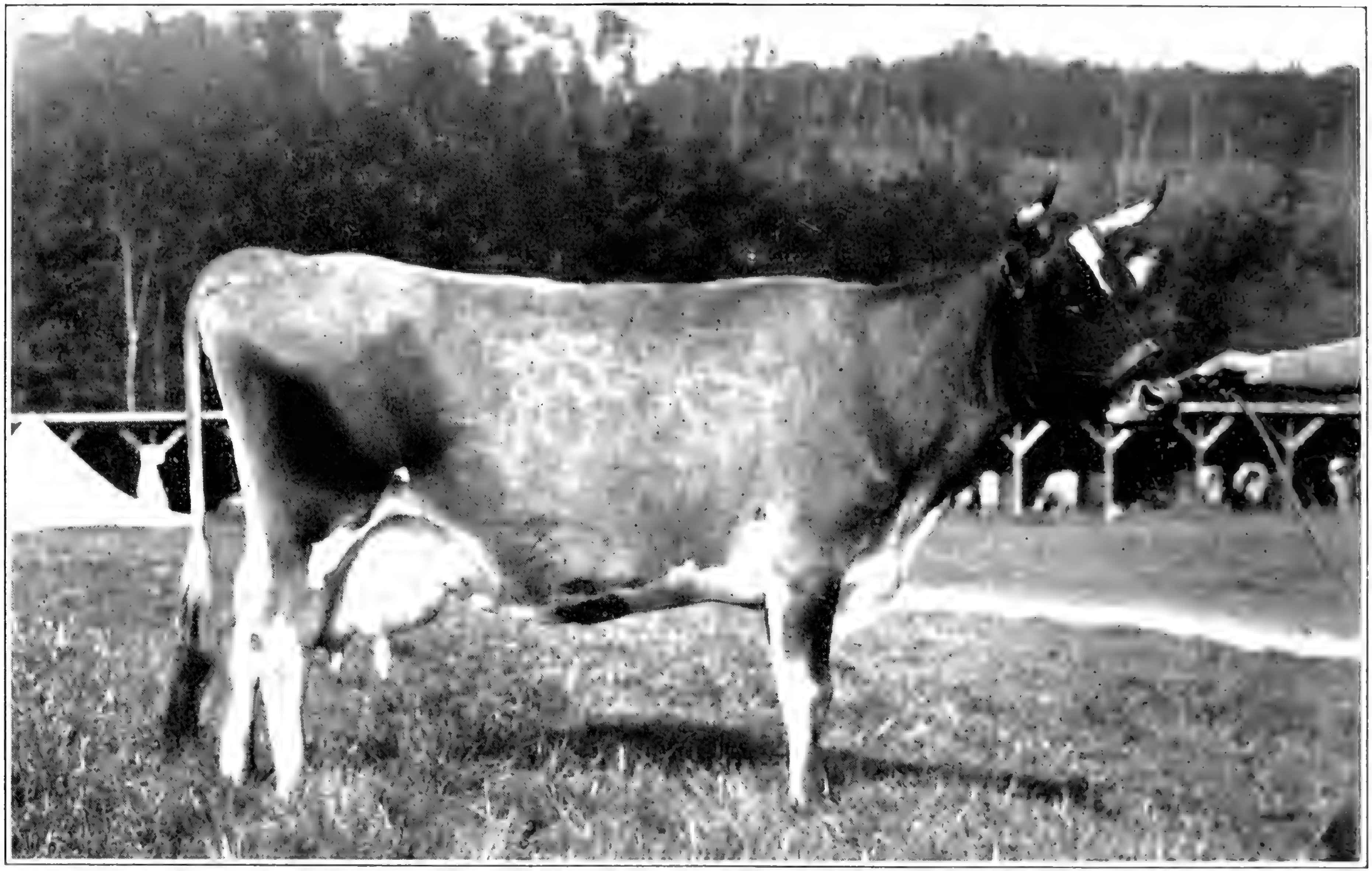
THE COW AND PURE MILK.

By Jas. A. Gamble, U. S. Dept. of Agriculture.

History gives little (authentic) information about the very early life of man. It seems certain, however, that his domain was the earth, and that the earth was inhabited by other wild creatures, some of which, no doubt, relentlessly sought to take his life, for he was by nature the most defenceless of them all. Very pressing was his need to husband and increase as soon as possible his resources. Among the creatures around him he found those which subsisted on grass and tender shoots as well as the fierce hunters of flesh that preyed upon one another.

Man, even in those early days, was averse to work, and he soon observed that some of the grass-eating animals were endowed by nature with that upon which their offspring seemed to thrive. I strongly believe that the calf was the first dairyman, and an object of interesting observation to the human creature, looking for that with which to satisfy his ever-returning hunger. Man had not then discovered fire and so subsisted on whatever came to hand in the raw state.

While the number of animals with which his nature would permit intimate association were few, he succeeded in time in domesticating the cow. She in turn gave him food, drink, and the wherewithal to keep himself warm. With these companions he whiled away the early centuries, and they became the first riches of mankind. He found them when a savage, and in the routine of caring for them the way was opened for his transition into the arts which made him civilized. So great did his dependence on this animal become that at length he came to worship it and on many primitive altars erected by peoples who have come and gone, we find the well-known figure of the genus Bos.



Kingleside Rosette, 185885. Register of Merit Class A A. 9832 lbs. milk, 560 lbs. butter in one year.
Owned by H. M. Tucker, Canton.

The changes that man has wrought in this animal are little short of wonderful. From one which gave only enough to sustain its young for a few weeks after birth, he has changed it to an animal which in some cases produces in a year milk enough to sustain fifty calves during the same period of their life. The rough head and strong shoulders of the cow in the early days required for self-protection have been supplanted by finer limbs, and she has become a thing of beauty and a source of profit. How was this done?

If we were to balance the rigid body of a boy horizontally on an upright so that his feet would tilt neither up nor down, and then give him a hard problem in mathematics to work out, what would happen? The blood would rush to the brain as his mind grappled with the problem and down would go the head. Just so with the cow: The constant manipulation of the udder and breeding for production have reversed the shape of the cow. Like her cousin, the American buffalo, she was wedge-shaped with the large end of the wedge forward, and now in the dairy type we expect to find the large end of the wedge in the rear. So much for the early history of the cow.

The term "milk" is taken from the Greek word, meaning to press out with the hand. It has come into general use in describing that fluid by which nature has made possible the existence of the human race and the continued life of many animals found closely associated with man. The word "milk" now calls to our minds the lacteal secretion obtained by the complete milking of one or more cows. It differs in a minor degree in the amount of the different constituents it may contain as it comes from the different breeds, but in the main it contains about 87 per cent water and 13 per cent total solids. These in turn are made up in part of milk sugar, fat, casein, albumen, and ash. The water in milk is the same compound of hydrogen and oxygen with which we are everywhere familiar.

During the past five or six years I have had the privilege of listening to many complaints from consumers regarding the quality of milk supplied to them. They complained that the milk was very thin, that it contained added water, chalk, preservatives, dirt, manure, milk tickets, buttons, snails, worms and bacteria. There was one lone complaint that "this morning our milk had an oyster in it." We have all heard stories regarding the tabooed practice of milk men's stopping at streams to water milk, and in adding from this source, admitting the telltale little fish or frogs. But this was the first time I have ever heard it intimated that milk had been diluted with sea water and was therefore likely to contain numbers of the family Crustacea. The oyster in question, I must explain in justice to the milkman, afterwards proved to be a small cracker. No doubt it had been part of the driver's breakfast or midnight lunch and had tumbled into the milk bottle which was afterwards filled with milk and delivered to the consumer making the complaint. In this fusillade the driver could hardly hope to escape unscathed, and many uncomplimentary things were said of him:—"We do not like him," "He smokes, chews, swears at his horse, is uncivil and unobliging; he comes too early, comes too late, makes too much noise, does not leave the right amount of milk, gives our neighbor better milk, does not seem to know the amount of milk we want unless we put out bottles and tickets, knew we had company and did not leave an extra pint." "I live on the eighth floor and take a pint a day and wanted a quart this morning and was only left a pint; can you recommend another milkman?" All these and many more!

For these grievances the consumer blames the Health Department and the driver who leaves the milk at her door. The driver in turn must find some excuse and he has been known to implicate the weather and the producer. The producer passes on the blame to the hired man. He, if he must get satisfaction, takes it out of the innocent cow, which, in the first place, gave it pure as was intended by nature, gave it patiently, willingly, and just as much of it as she could.

It can hardly be successfully argued that milk from the healthy cow, by whatever adjective best described when it reaches the consumer, be it certified, inspected, high-grade market, low-grade market, grade A, B, C, or D, was not a milk which met the exacting requirements of "Certified" when the cow gave it. If it has fallen below that high standard, let us not blame the cow, but man and conditions over which he has almost complete control.

All this is said to point to you men who are left behind the cows, as the chief factors to be interested if better milk is ever to be secured. On you, in the final analyses, must health officials, systems, and inspectors rely for results, and cities and towns for pure milk.

In the last annual report of an international committee on dairy farm inspection is the following interesting paragraph: "This committee believes that the production of a clean and reasonably safe milk is a comparatively simple process, easily within the reach of all careful dairymen, if paid a price sufficient to induce them to become genuinely interested in its production." From this we gather that if the financial coöperation of the consumers can be secured, the dairyman will become more interested in the production of a better milk. Lack of interest has relegated dairying to the position of a side issue on too many natural dairy farms, to the detriment of both the farms and the quality of milk produced there. The average dairy farmer's time in bed just before he gets up in the morning is not, I fear, devoted to plans for the dairy, but rather is taken up with thoughts of the drawing of logs, the making of maple sirup and other works in season.

When the general public begins to discriminate in the purchase of its daily supply of milk, it is high time that dairymen interested in the future prosperity of their business recognize this tendency, and put themselves in position to meet this now well-defined movement for better milk. That consumers are beginning thus to discriminate must be conceded if the constantly increasing call from them regarding the chemical and bacteriological analyses of their supply is any criterion. And we find this to be the condition. This situation holds something of interest for the wide-awake dairyman because the success of his business depends upon how intelligently he interprets and meets these demands.

From facts at hand it would seem that the coöperation of the consumer is slowly but surely coming. You say, and I agree, that better milk can not be had without a better knowledge equally on the part of producer, transportation agency, dealers and consumer, of those factors which affect its purity and keeping qualities.

Let us take up briefly a few of the factors which determine quality in milk and are within the influence of the producer to control, for I believe that they are both easily understood and easily carried out. May I say that this has been repeatedly demonstrated on many farms and can be on yours?

Milk as it comes from the healthy cow is both clean and safe, but it is easily contaminated. This contamination may be measured by the number and kinds of bacteria the milk contains. Bacteria are very tiny one-celled plants, too small to be seen with the naked eye. They are found everywhere in nature and play a most important part in the life of man. It has been said that without them we cannot live, and again, without them we cannot die. This divides them into two distinct groups. The latter merits our careful attention, so that we may curtail as much as possible their efforts and thus promote the welfare and happiness of our people.

In considering this matter let us deal only with those factors which have both a direct and important part in the purity and keeping quality of milk. In speaking it is well to bear in mind that it is naturally a pure product.

With healthy cows perhaps the most important foreign matter to be kept out of milk is manure; certainly the types of bacteria that one may unquestionably find there are not desirable inhabitants of milk. You are all aware of the fact that the excrement of the cow contains that part of the food which her body does not assimilate and the intestinal tract may harbor enormous numbers of objectionable bacteria. The cow, the barn and the stable yard should be clean. Clean bedding should be provided. These little precautions should materially reduce contamination from these sources. Loose hairs from the flank and udder of the cows also often get into the milk. Washing these parts or going over them with a wet cloth just previous to milking is of much assistance in curtailing the contamination from these sources. The feeding of dry corn stover or grain before or during milking is also a channel by which dust may find its way into milk.

Perhaps the covered milk pail is the best single device to assist you in reducing to a minimum the foreign matter which often finds its way into milk. Needless to say, the hands of the milker and all utensils used to hold, strain, or convey milk should at all times be kept thoroughly clean. I believe also that there is more reason for keeping the animal which produces food for ourselves and our babies clean, than to spend extra time grooming and cleaning the horses which draw the manure and the garbage wagon. Yet custom demands that the horse be kept clean. Feeding dry feeds and grain after milking instead of during or before milking adds nothing to the cost of production but vastly improves the keeping qualities of the milk. The removal of manure each day to the field or proper pit adds to the expense, it is but true, but our experiment stations tell us that by so doing we save plant food, so this is actual economy. The immediate cooling of milk is not added expense, for if it be cooled at all the price is the same one time or another.

Investigators tell us that about 4 per cent of the bacteria found in milk after it has been produced in the ordinary stable is from the udder of the cow; that about 26 per cent is from the stable air, the milker, and the milking utensils; that the rest of the total number, 70 per cent, is from the body of the cow. With these facts in mind we may readily see that 4 per cent we have with us always, while 96 per cent can in a large measure be prevented from gaining access to milk.

Many interesting experiments have been conducted showing the effect of the various common dairy practices on the bacteria count of milk. These prove that if we use a covered pail instead of an open pail in milking, it is possible to reduce the bacteria count 97 per cent in a poor stable, and in a well-kept stable 86 per cent; that if we milk before feeding dry feeds, we may lower it 30 per cent; if we milk before feeding dry stover, 66 per cent; that if we wipe the udder and flanks with a damp cloth just before milking, we may diminish the count 77 per cent; and even that different men milking the same cows under the same conditions may give us a difference of 90 per cent in the total number of bacteria present.

All the above practices have an important bearing on the quality of milk, but in seeing to it that they are carried out let us not lose sight of the fact that after all of these precautionary measures have been taken, we may, by allowing the milk to remain warm, undo all our careful work in keeping the number of bacteria present to as few as possible. We are forced to the conclusion that temperature plays a most important part in controlling the number of these organisms a milk may eventually contain. One thing which we dairymen desiring a low bacteria count should remember, is that no milk, however carefully produced, if allowed to remain warm or after being cooled is permitted to become warm again, can be expected to have a low bacteria count.

The effect of temperature on the keeping quality of milk is graphically described in the following chart. Two quarts of milk about 27 hours old when secured were purchased from different dealers. No. 1 had a bacterial count of 280,000 colonies per cubic centimeter, No. 2 had a bacterial count of 16,400 colonies per cubic centimeter. Each bottle of milk was divided into four samples and one sample from each bottle was maintained at the following temperatures, 75°, 55°, 40° and 100° F. until it developed a faint trace of acidity, when it was eliminated from further experiment. The milk from each bottle was thoroughly mixed every twelve hours and a sample taken for bacterial count and acidity.

Diagram showing by lines the comparative length of time different parts of samples 1 and 2 held at 100°, 75°, 55°, and 45° F. remained sweet which affords a striking illustration of the necessity of keeping milk at low temperature during the entire process of handling until it is consumed:

No. 1 at 100° F. – – 12 hours.
No. 2 at 100° F. – – – 36 hours.

No. 1 at 75° F. – – – 36 hours.
No. 2 at 75° F. – – – – 60 hours.

No. 1 at 55° F. – – – – – – – 80 hours.
No. 2 at 55° F. – – – – – – – – – 180 hours.

No. 1 at 40° F. – – – – – – – – – – – – – – 180 hours.
No. 2 at 40° F. – 396 hours.

Flavor and odor also enter very largely into and determine the commercial value of milk. "Off flavors" in milk are to be avoided, as they are certain to mean "kicks" from the consumer, and these in turn mean loss of trade to the dealer and more trouble for the producer. These are often caused by feed. Needless to say, the indiscriminate feeding of such feeds as turnips, cabbage, and the like tend to injure the flavor and the odor of milk; hence they are to be avoided.

In closing, let me say that three simple rules will give us high-grade milk; healthy cows, clean men, prompt cooling. I believe the demand for better milk has come to stay and also that in its production one intelligent man who knows how is of more value in a dairy than are two men who will not take the trouble to learn how, but depend upon a list of regulations covering the side of the barn to guide them. Let us not forget that the domestication of animals gave man his first security from hunger and that dairying in this country is a great industry. The census of 1909 valued the annual dairy product in the United States at very close to $600,000,000. In 1912 the value of all the gold taken from the mines of all the world was less than $500,000,000. Gold can be taken from the mine but once. The $600,000,000 represents annual production and there is the cow left.

SOME DISEASES OF THE POTATO.

(An Illustrated Lecture).

W. J. Morse.

Very few of our agricultural crops of temperate regions are subject to so many and so varied diseases as the potato. There are several different factors which are responsible for this. In the first place it is now grown under conditions much more varied and often much more unfavorable than those of its natural habitat. The plant has been greatly modified and changed under cultivation, particularly with reference to its tuber producing capacity and the time required in which to do this. It would not be strange if this was brought about at the expense of certain other characters, such as disease resistance, etc. Moreover, man has carried the potato to the ends of the earth and back again, and on its way it has picked up a varied assortment of parasites of different degrees of importance and the distribution of these parasites has been greatly facilitated by the fact that the edible portion of the plant is succulent, is produced in the ground, and is used for reproductive purposes.

It is not my intention nor desire to spend time threshing over old straw, but in the potato industry, as in anything else, the significance of certain well known facts is often overlooked. Moreover, from events which have taken place during the past few years, it is evident that certain facts in connection with the potato industry in Maine cannot be pointed out to us too frequently or too emphatically if the industry is to be permanent and continue to grow and develop in the manner in which we have every reason to believe it is capable of doing.

Maine today produces one-third as many potatoes as were grown in the entire United States at the close of the Civil War, and the total yield of our potato fields has trebled during the last

15 years. Judging from the amount of land which, if placed under cultivation, would be suitable for this purpose it is evident that we have not yet really begun to raise potatoes. In fact, there are thousands of acres of such land which has been cut over and burned over which is today not returning the taxes, to say nothing of interest charges. When this land does become available for potato raising are we, by the exercise of proper foresight and care, to protect it permanently from infection with dangerous tuber-borne diseases so that it may contribute annually to the wealth and prosperity of the state, or are we through carelessness or for the sake of saving a few dollars on the cost of the seed for a single season going to risk contaminating it, perhaps permanently, with the germs of powdery scab or some other more dangerous disease?

On account of the peculiar relationship of Maine to other potato producing sections of the country, especially in the south, this question of guarding against the introduction and spread of dangerous potato diseases within the borders of the state is perhaps a matter of greater importance to us than to any other potato producing section of the country. As you well know, the growing of potatoes as a late winter, spring and early summer crop has developed into an industry of some magnitude in the states to the south of us. It has been found, however, that under the climatic conditions which exist from Maryland and Virginia south to Texas, potatoes rapidly deteriorate, and while they frequently grow two crops a year it is necessary to secure seed from northern states at least once a year. Climatic conditions of Maine, particularly the northern part, seem to impart just the required vigor necessary for seed to be used in southern states. Hence they have been coming to us in increasing numbers to purchase potatoes for that purpose. This has had much to do with the recent development of the industry in our state, since it has created an entirely new demand for our product and a demand which in a measure has tended to lessen the competition of those states which are growing potatoes only for table purposes.

Unfortunately nature has been too kind to us here in Maine in certain respects. The fact that it is possible by using large amounts of fertilizer to produce reasonably good crops of potatoes when culls or even diseased tubers are planted, has led many to think that this thing could be carried on indefinitely and caused them to scoff at those who maintained that a day of reckoning would come sometime. They also assumed that a similar grade of seed would do in the south. I do not mean that this was the attitude taken by the majority or even the average of the potato growers, but it only takes a few delinquents to ruin the reputation of a community. Fortunately our reputation is not yet ruined and the numbers who hold these views are annually growing less.

The greatest difficulty which we have encountered with the growth of our seed business is that it has come about so rapidly that it has been actually forced upon us, and neither the producer nor the purchaser recognized any difference between table potatoes and seed stock. In fact, one of the greatest difficulties which the Maine seed growers have had to overcome is the lack of appreciation of extra selected stock on the part of the southern purchaser in many instances, and his desire to buy only where potatoes could be obtained the cheapest.

This is not the place to enter into a discussion as to the merits of the case or to decide who is to blame, but nevertheless the southern planter has not always secured the results that he should, possibly from the way in which he handled the seed after it came into his hands. Regardless of the causes, our reputation has suffered in consequence. It is our business in the future to see that only the best of seed is used upon our farms or sold for that purpose to go south. If we do that we have done all that can be required of us.

The pictures which I shall show are largely confined to potato diseases which are carried by the seed tubers. It is important and desirable that potato growers should learn to recognize as many of these diseases as possible, but it is by no means absolutely necessary. It does not take a very keen observer to distinguish a normal or healthy potato plant or tuber from an abnormal one. If only healthy tubers from healthy plants are used for seed purposes, and as an extra precaution these tubers are disinfected before planting, much of the danger of the propagation and spread of destructive potato diseases would be eliminated. This fact is well illustrated by the introduction of powdery scab. Regardless of whether or not common scab exists in the soil, it is not regarded as good practice to add more by planting scabby seed. Therefore, plant pathologists have strongly urged that only clean, disinfected seed be used for planting. Had this recommendation been followed powdery scab would not have been introduced. Hence, to keep it out, it is not even necessary for the farmer to know the difference between common scab and powdery scab.

SEED POTATOES.

The first slide represents a potato field taken in Virginia. It is not the result of an experiment, but the result of an accident. The seed on this field came from two sources; in one case it was good and in the other bad, and it so happened that, without design, a barrel of good seed and then a barrel of poor were planted alternately. (The field showed strips with a perfect stand alternating with those where the crop was practically a total failure.) In contrast with this let us look for a moment at a picture of a Maine field planted with healthy, carefully selected seed.

Some years ago the Maine Agricultural Experiment Station was in the market for some high grade Cobbler seed. Several growers were recommended as having first-class stuff. The seed was purchased from two of these. The next slide shows some of the tubers sorted out of one of these lots which were sold to the Station as being a first-class article. Attention is called to their small size and poor quality.

On account of our short season for harvesting it is necessary to handle potatoes very rapidly and often more roughly than we would desire. Rough handling should be avoided as much as possible, as injuries and cracks like those shown in the next picture give an opportunity for the fungi which cause storage decay to gain entrance.

The next shows a trouble, sometimes spoken of as "black-heart," occasionally encountered with potatoes shipped south in the winter. It is caused by over-heating the cars in transit and is nothing that can be communicated to other tubers.

Up in the mountains of Colorado, on the western side of the Continental Divide, two business men have gone into potato raising on a business basis. They are not writing books, delivering lectures, selling land or seed stock, and in many respects

I believe are the foremost practical potato growers in the United States. The reason for this is, I believe, that these men have made a thorough study of their business from all points of view. They do not fail to make use of every scrap of scientific or practical information they can obtain so far as it is applicable to their conditions. By careful selection and attention to other details they have largely eliminated disease and low-producing strains in their stock. They have been selecting their seed from high producing hills and propagating it for their own use. Each year they plant a field of this selected seed from which to grow the seed for their main crop the next year. For their conditions they think whole seed tubers are the best. Therefore, on this seed plot they crowd the potatoes very closely together in order to get a large number of small tubers.

The first picture shows a single hill (10 tubers) of Peach Blow potatoes raised under these conditions for seed purposes. The second, a hill of Russet Burbanks weighing 7½ pounds, the tuber at the top showing the type of the original seed planted. In the next picture at the left is a hill of Comet potatoes, weighing 4½ pounds; next, three hills of People's weighing 12½ pounds; next, the hill of Peach Blow seed shown in the first picture; next, the Burbank hill shown in the second picture. The row of potatoes on the extreme right are Gold Coins, 4½ pounds to the hill.

BLACKLEG.

Now, coming back to our subject of Maine potato diseases, the first picture shows a potato plant affected by blackleg. Note the conspicuous blackening of the base of the stem extending from the point where it joins the seed piece up just above the surface of the ground; also the tendency of the foliage to grow upward rather than to spread out in a normal way. These, taken with the fact that the plants are often stunted, usually a lighter green or yellowish, are important characteristics of the disease.

The next picture shows another plant affected by the same trouble. With the blackleg disease, and certain others which injure or destroy the parts below ground, there is a tendency to produce aerial tubers or tuber-like outgrowths in the axils of the leaves above ground, as shown by the next illustration.

Blackleg is a bacterial disease, is carried only by the seed potatoes, and does not live over winter in the ground in Maine. The next picture shows the base of an affected stem and a cross section of a tuber having the characteristic soft rot or decay associated with the disease. In this case the disease has spread back from the parent stem along the tuber-bearing stolon and affected the base of the young tuber.

The next picture shows a potato plant grown in the greenhouse and inoculated with a pure culture of the organism causing the disease.

Blackleg is a comparatively easy disease to control. It may be entirely eliminated by carefully sorting the seed and removing all which show any rot or diseased areas or any which are apparently cracked and jammed, and then disinfecting the remainder with corrosive sublimate or formaldehyde before planting. Each seed cutter should have two knives and a glass jar filled with formaldehyde solution of the same strength as used for disinfecting the tubers. If, by chance, a diseased potato is overlooked and found on cutting, it should be thrown away and the knife dropped into the jar of disinfecting solution and the other used in its place until another diseased potato is cut.

COMMON AND POWDERY SCAB.

The next picture shows a potato tuber attacked by common scab. This condition is too well known and prevalent to require comment. Potato scab has been reported on a few other vegetables or root crops, but on none of these is it of any importance except occasionally on beets. The next picture shows a very interesting case on turnips, the only one I have ever seen.

There used to be much discussion and sometimes there is now as to whether or not ashes, chip dirt, etc., could cause scab. It was proven quite conclusively over twenty years ago, and has been demonstrated repeatedly since, that the disease is of a parasitic nature and only can occur where the parasite exists in the soil or is introduced with the seed tubers. The ashes, chip dirt, etc., are favorable to the growth of the organism but do not cause scab themselves. Regardless of how much lime or ashes is placed in the soil, scab will not appear in experimental tests if the soil is sterilized, and clean, disinfected tubers are planted therein.

The next picture illustrates a bad case of scab resulting from inoculation with a pure culture of the scab organism.

While it is well known that potato tubers carry the disease, it is a matter of considerable practical interest as to whether or not the manure of stock fed with scabby potatoes is also a source of infection. Some experiments carried on at the Maine Agricultural Experiment Station a few years ago bear upon this point. For two years in succession a horse and a cow were fed scabby potato tubers in amounts equal to or in excess of those likely to be used on the farm. After this had gone on for several days the manure from these animals was collected in sterilized receptacles and then mixed with pots of sterilized soil, in which potato tubers free from scab spots and disinfected with formaldehyde were planted. At the same time similar potatoes were planted in pots of the same sterilized soil, but without the addition of manure. In the first case about one--fourth of the potatoes produced in those pots where the horse manure was used were scabby. None appeared where the cow manure was used or in the check. The second year, nearly four-fifths of the tubers where the horse manure was used were scabby, and one-sixth where the cow manure was used. The check again was clean. The first picture shows the check, the second, the average condition of the scabby potatoes where the cow manure was used and the third, the average appearance of the diseased tubers where the horse manure was used.

The final conclusion was that limited amounts of uncooked, scabby potato tubers could be fed to cows with a fair degree of safety, but that the germs of this disease readily pass through the digestive tract of a horse in a living condition.

The next picture is intended to show the difference between common and powdery scab. As will be seen, common scab produces relatively large, more or less irregular brown spots, usually with a decidedly uneven suface. Powdery scab forms only small spots which are at first in the form of pustules containing a brownish or olive-colored powder. Later, the tops of the pustules become rubbed off, leaving small scab-like spots as shown in the lower and middle part of the picture.

One important difference between common and powdery scab is that the first produces only one form of injury upon the potato. Severe cases of powdery scab may lead to quite different

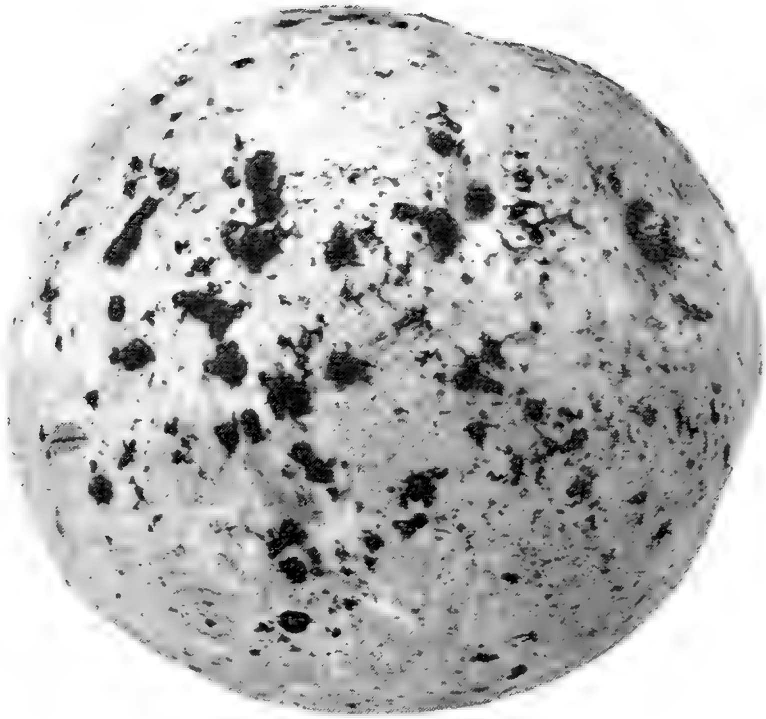
Potato seed-piece the sprouts of which have been killed by Rhizoctonia before reaching the surface of the ground.

Rhizoctonia. Young potato plant showing lesions produced on the stem below ground early in the season.

Base of potato plant showing lateral branching and partial recovery following the killing of the top of the original sprout early in the season, by Rhizoctonia. The tops, which were removed before photographing, were nearly normal in size but the plant would produce no merchantable tubers.

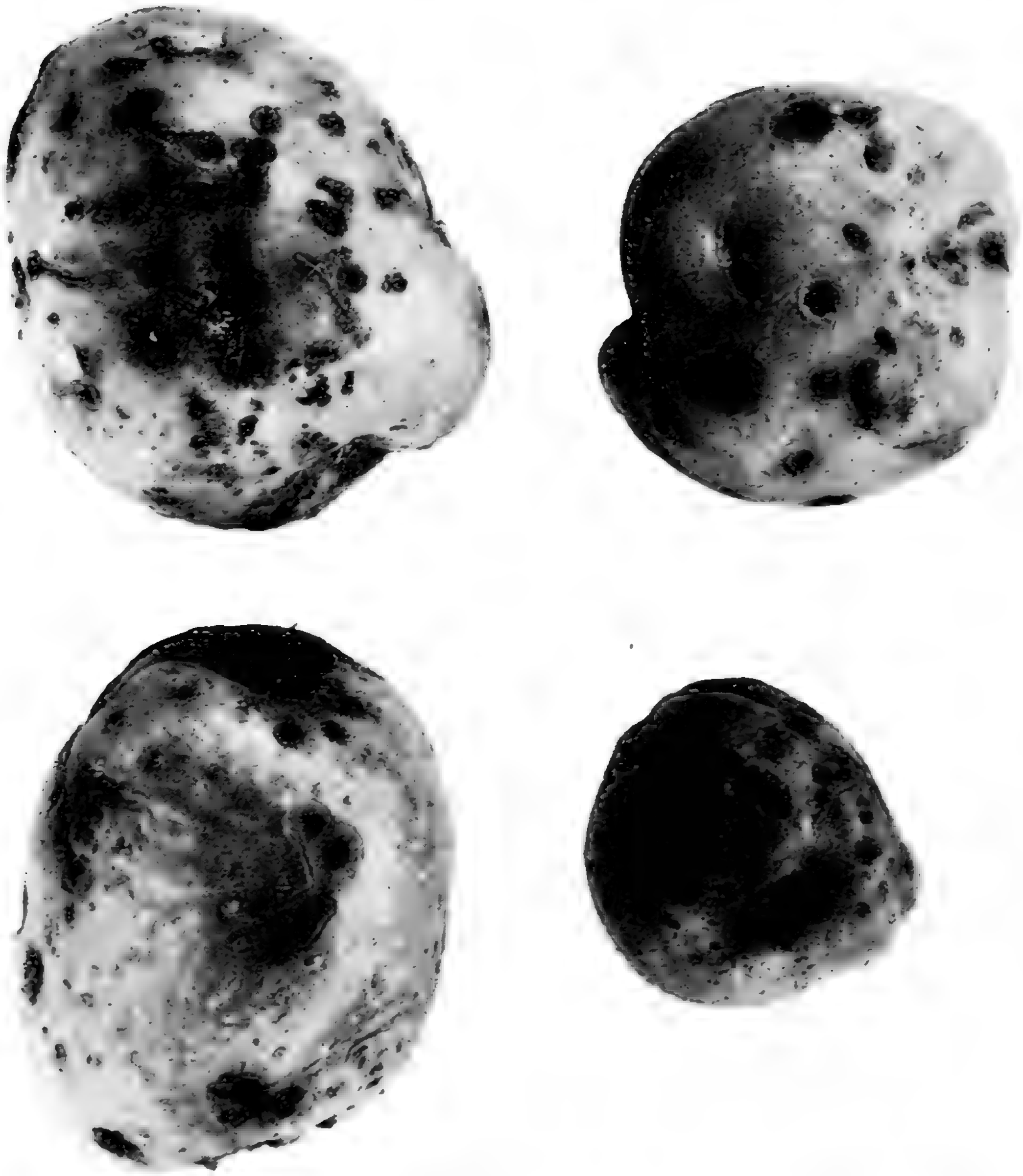
An advanced case of Rhizoctonia stem injury.

Clusters of tubers formed at the surface of the ground after the parts below had been badly injured by Rhizoctonia.

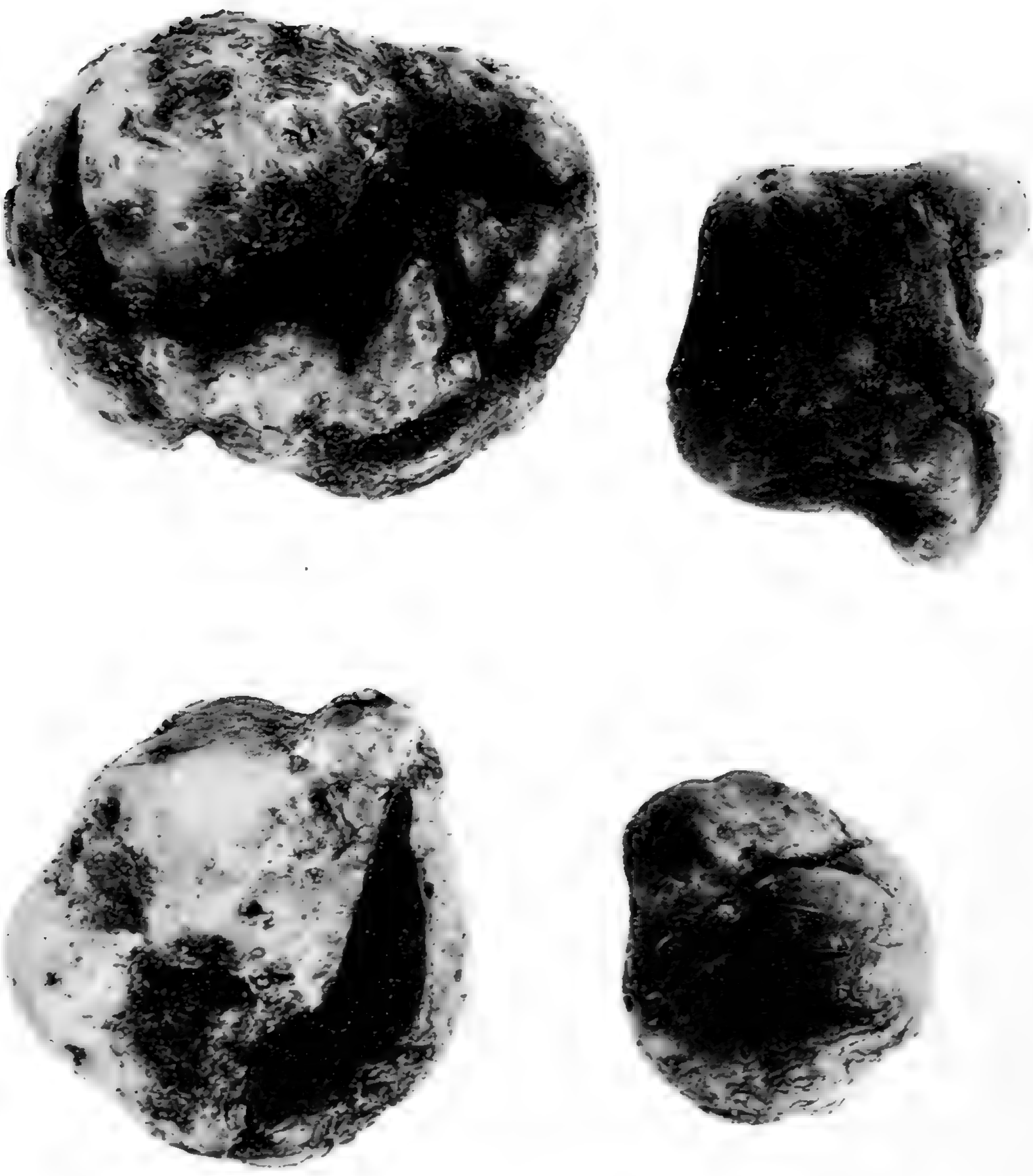


Sclerotia of Rhizoctonia
(*Hypochnus solani* P. & D.)

Scab-like spots produced by Rhizoctonia.

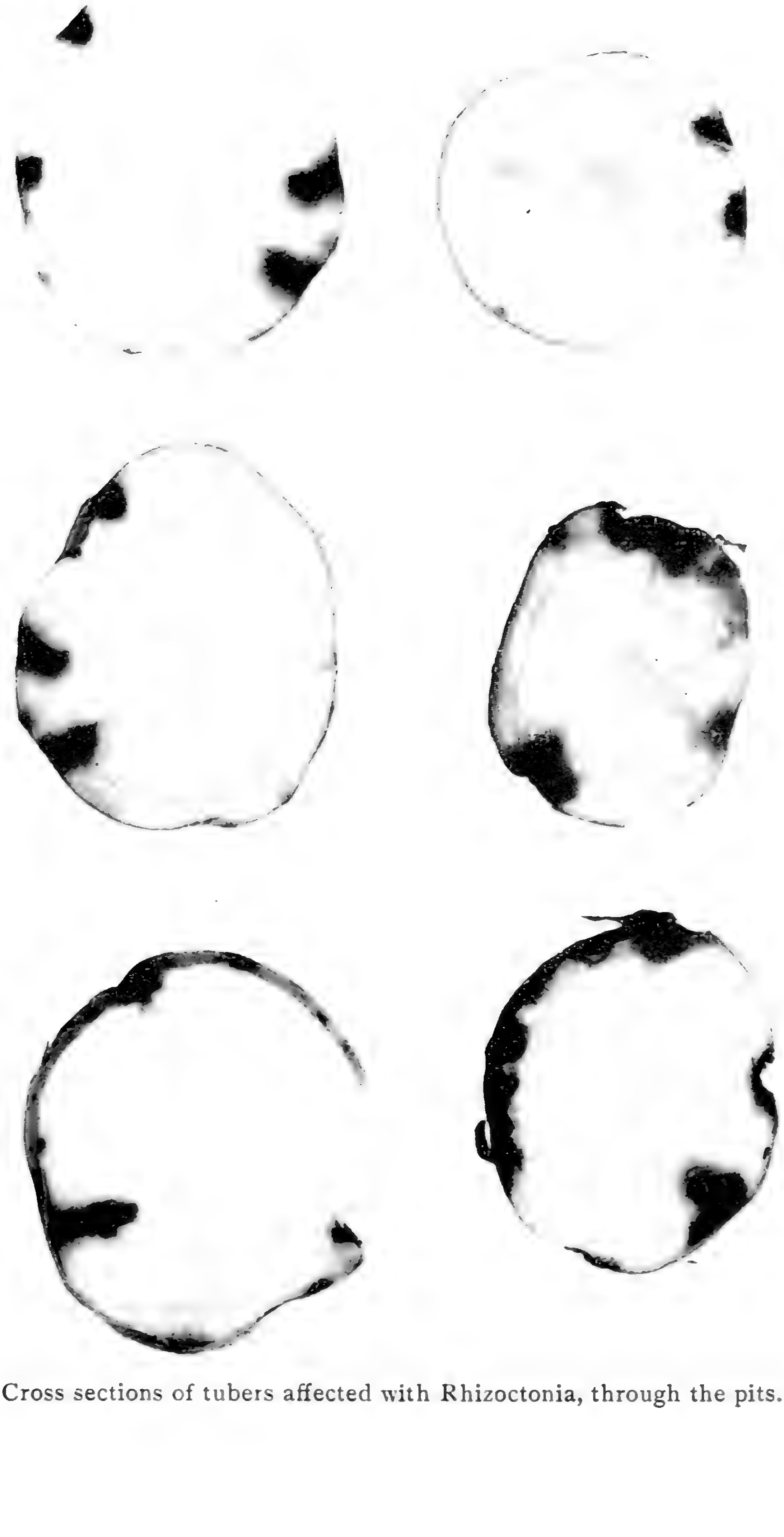


Pitting of the tubers which is frequently associated with bad cases of Rhizoctonia injury on other parts of the plant.



Splitting and cracking of the tubers following severe attacks of Rhizoctonia.

Necrosis of the stem end of the tuber following bad attacks of Rhizoctonia on the parent stem.



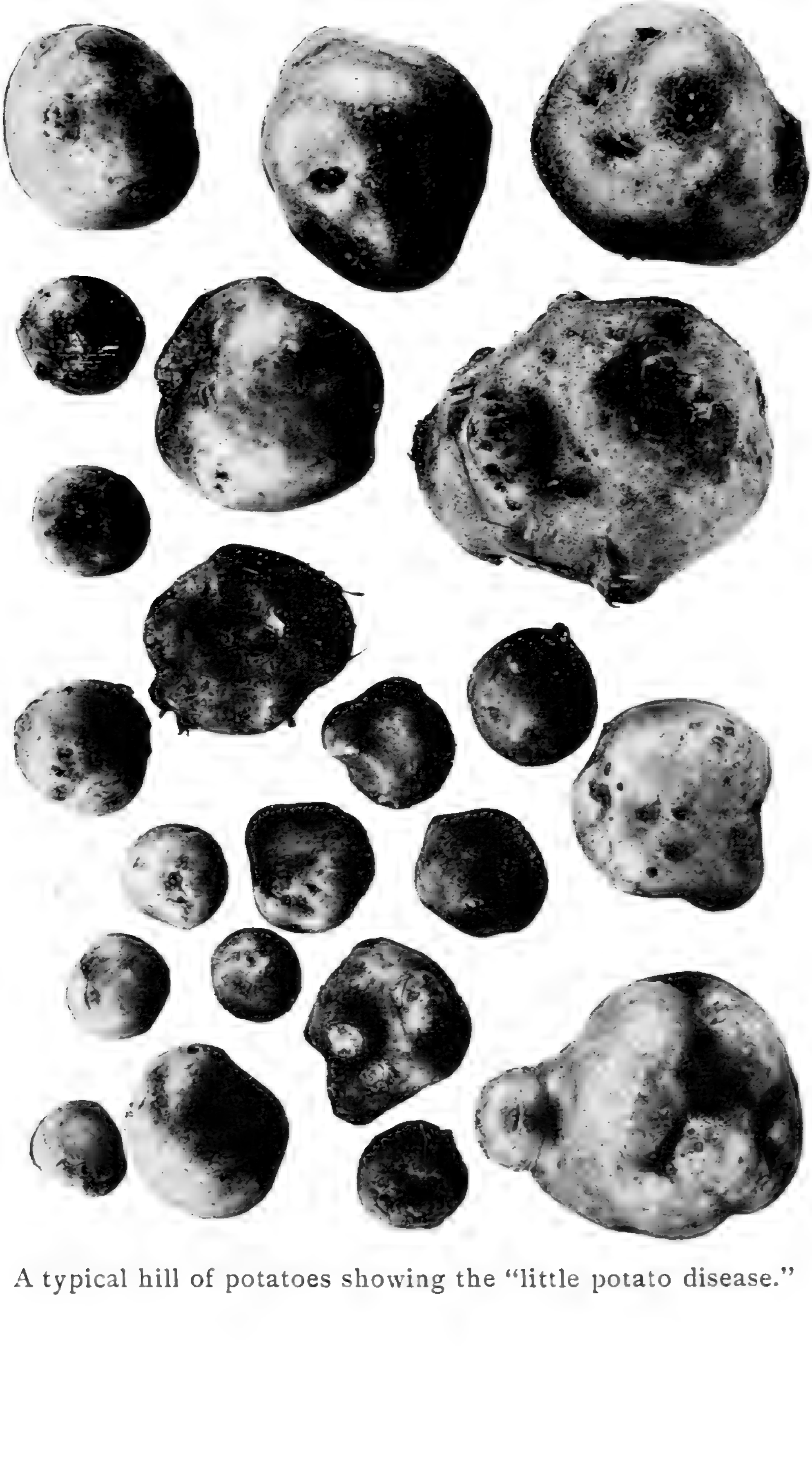
Cross sections of tubers affected with Rhizoctonia, through the pits.

Two potato plants showing advanced stages of the blackleg disease. Note the decided blackening at the base of the stem.

Common scab, caused by *Oospora Scabies*
—Thaxter.

Powdery scab, ordinary stage after having the tops of the pustules removed by rubbing against other tubers—the usual appearance when collected from storage bins in winter.

A badly withered tuber—a common occurrence with tubers affected by powdery scab, after remaining some time in storage. The tops of nearly all of the pustules have disappeared, leaving scab-like spots.



A typical hill of potatoes showing the "little potato disease."

results. Two different types of powdery scab are shown in the next picture. The tuber at the left represents the ordinary type where the tops of the pustules have been rubbed off, leaving the scab-like appearance. The smaller potato at the top shows a decided cankered area where the tissues have been eaten into and hollowed out. So far we have not found this type of disease in the fields of Maine. We may expect it in severe cases of soil infection, for the tuber shown in this illustration came from Canada.

The tubers shown in the next illustration represent a severe type. The slide was made from a photograph of some potatoes which we grew in the greenhouse.

The next slide shows how, in case of bad attacks of powdery scab, the potatoes tend to wither and show an apparent dry rot.

RHIZOCTONIA.

There is a fungus which has long been known to students of pathology as Rhizoctonia. This fungus is, and probably has been for years, as common as pebbles in New England potato soils. Moreover, it is of widespread distribution in the United States. This summer I had an opportunity to examine some hundreds of potato fields in a dozen different states from Maine to California. In very few of these fields did I fail to find the disease caused by this fungus after five or ten minutes' search, and in many instances the injury to the plant was such as to materially reduce the yield on the field. This was particularly the case in one noted potato section of California. In the past a few people have said that the fungus was injurious to potatoes, but as a rule their statements have not been taken seriously. I believe that the work that we have done at our Station during the last fifteen or eighteen months shows conclusively that it may be at times the cause of very serious disease in some parts of Maine.

As the first picture will show, the ordinary form of this fungus is undoubtedly well known to every housewife or others who have occasion to prepare potatoes for the table. The little brown or black, closely adhering spots of dirt which won't rub off are not dirt at all, but the over-wintering stage of the Rhizoctonia fungus,—simply compact masses of the sterile fungous threads. The fungus does practically no harm here, but gets in its work in the summer when both it and the potatoes are growing.

The next picture throws a flood of light upon the question of the cause of the weak and uneven stands of some years. As you see, the seed-piece sprouted all right, but portions of the sprouts below ground have turned dark brown, one has been cut off, and all three are so badly injured that they will never reach the surface of the ground.

We maintain and feel that we have proved, that this is caused by the Rhizoctonia fungus. The next picture shows some potatoes which sprouted in sacks in the cellar, and the fungus attacked them there. Some of the sprouts have been entirely destroyed. The next shows another seed piece, the sprouts of which have all been killed back but one and this will soon die.

Along about the time the plants are about five to eight inches high, and have been covered up once or twice, we frequently see quite a percentage of them that are just peeping above the ground. If you inquire of the owner of the potatoes the cause of it he usually explains it as weak seed or one where the seed piece fell so as to have the eye down and thus delayed the sprouts in reaching the surface. The next three pictures show how some of these plants look when dug up. In the first, the stem has been attacked in various places near the surface, but not sufficient to kill it as yet. You will note that differing from blackleg the disease does not always start at the base and work upwards. Another important difference is that the lesions produced by the Rhizoctonia fungus are brown and not black as in the case of blackleg. The general appearance of the affected tops above ground may be somewhat similar in the two diseases. In the next picture several sprouts have been killed and the last one is about to go. In the next, some have been killed and one of the three remaining was so badly injured that it was easily broken in digging up, and the others are nearly equally diseased.

On a field that showed about 1 per cent of the plants affected like this a later examination showed that 91 per cent of the plants were attacked in one way or another.

Oftentimes plants which are badly attacked and cut off, branch out and send up new shoots which later grow into respectable looking tops, but produce only small potatoes. One of the characteristics of the disease is that the tops may, as a rule, look fairly strong and healthy and give promise of a good yield, but when dry weather comes, will ripen prematurely and the yield will be disappointing, such potatoes as are produced being numerous and below marketable size.

The next picture shows the fruiting stage of the fungus which grows up around the base of the stem of the potatoes, producing a grayish felt-like growth. This latter may occur without any apparent injury to the stem.

The fungus not only attacks the main stem but the tuber-bearing stolons, often cutting these off as soon as formed, or before the tubers on them have attained any considerable size. The next picture shows the base of the stem badly affected in this way with the tubers clustered about and at the surface of the ground. The next slide illustrates the potatoes dug from a single hill. This is sometimes spoken of as "little potato disease." Here, as fast as the tubers are formed or had attained but little size, they were cut off from the main stem by the fungus. There are 39 potatoes in the hill.

Frequently the fungus follows back along the stolons and attacks the stem end of the tuber, as shown by the next picture, where the base of the tuber becomes browned around the stem, and sometimes a form of necrosis sets in and eats away the tissues in this region.

Occasionally tubers themselves may be attacked when young, but not cut off from the stem. In bad cases of injury of this kind they are apt to become badly cracked and misshapen, as shown in the next picture.

Sometimes, when the disease is very destructive, a peculiar form of pitting of the surface, which apparently is caused by the fungus, is observed. This resembles somewhat the channels made by wireworms and we believe is frequently confused with their work. The next picture shows tubers affected in this way, and the next a cross section of the same.

As yet there is very little that we can say regarding preventive measures. Corrosive sublimate seems to be the most effective disinfecting agent for Rhizoctonia, but the seed planted should be as free from the fungus as possible. The land on which it occurs in a destructive manner should be given over to other crops as long as possible before being again planted to potatoes.

POTATO WILT.

There is a type of potato trouble common in some other states, particularly in the west, but which as yet has not occurred to much extent in Maine, which has been classed under the name of wilt. Two different species of fungi have been found associated with this, but this fact is unimportant from our standpoint. The plants, as shown by the next picture, after they reach the size when the tubers begin to set on, may wilt and die more or less suddenly. Sometimes the lower leaves begin to die before there is much evidence of wilt. If such plants are pulled up and the stems cut across at or a little below the portion which is at the surface of the ground you will find a grayish or brownish discolored ring in the tissues near the outside. This is the region of the water, conducting system of the plant, and the wilting is due to the fungus growing up through and clogging the vessels which supply the water to the tissues above. If the tubers have begun to set and a cut is made just below where the stem joins the tuber, a browning or discoloration may be found here. Sometimes this ring of discolored tissue extends some little distance from the stem end toward the tip. The next picture shows some marked cases of the stem-end discoloration. Next, a longitudinal section of the tuber affected in the same way. The next, a dry rot of the potato caused by a related fungus.

The next picture shows a trouble, net-necrosis, which is by no means uncommon in Maine, but while it greatly resembles the appearance caused by the attacks of the wilt disease fungus upon the tubers, has never been shown to be parasitic. However, such tubers should not be planted, and the man who discards all potatoes showing any suspicious discoloration in this way will insure himself against the introduction of wilt. Once the fungus gets entrance into the soil it may persist there for some time.

SILVER SCURF.

Silver scurf, shown in the next two illustrations, is probably of minor importance as a potato disease. It is of particular interest on account of the fact that it became very prevalent and widespread in this country, especially in Maine, before it was recognized even by the pathologists. It probably does very little damage in our cool storehouses and northern climate, but when our potatoes are shipped south for seed purposes, those which are affected by silver scurf appear to dry out and deteriorate more rapidly than those which are not. Therefore, seed not affected by this disease should be obtained if possible, as none of the well-known disinfecting agents appear to have much effect upon it.

INTERNAL BROWN SPOT.

Internal brown spot, which is characterized by rusty brown specks or spots in the flesh of the potato and scattered promiscuously through it, is very rare in Maine, but more common in certain western sections. It is non-parasitic, and there is no direct evidence that the trouble is carried with the seed, although on general principles potatoes so affected should not be planted. It is undoubtedly due to some defect in nutrition or environment during the growing season, and is usually associated with dry soils or dry seasons.

ARSENICAL POISONING.

The next picture shows a severe case of arsenical injury which is likely to occur when large quantities of paris green were used without the addition of lime, while certain other arsenical poisons produce the same result. The illustration is taken from a photograph of a leaf sprayed with a compound recently much advertised as being able to kill the bugs and act as a tonic to the plant. It will be noted that the injuries on this leaf are all surrounding punctures made by the flea-beetle.

EARLY AND LATE BLIGHT.

Early blight which is shown in the next two illustrations may attack the plants at any stage of their growth, but frequently occurs earlier than late blight. Late blight shows a preference even for strong, vigorously-growing plants. Early blight is more likely to attack those which are weakened by flea-beetle injury or dry weather. It will be seen that early blight is more of a spot disease, and while these spots may run together and cause the death of the leaves, the individual ones are relatively small in size, somewhat circular or angular, and always stop at a vein or midrib. Early blight never causes a decay of the tuber. Late blight, as shown in the next two illustrations, produces large blotches on the leaves rather than spots, and when the conditions are right these spread very rapidly and kill the entire leaf. They do not stop at the midrib or vein, and are surrounded by a yellowish or lighter green color, fading off from the healthy green of the unattacked portions of the leaf. The under side of the diseased spots on the leaves, if examined early in the morning after a heavy dew, or on a cloudy day following a rain, will show a very delicate, faint, white fringe which is almost invisible to the naked eye. This is made up largely of the fruiting organs of the fungus which produces spores in great numbers in moist, cloudy weather.

Occasionally the disease may attack the more succulent stems as well as the leaves. This is well shown in the next two illustrations which were made from material collected in Van Buren some two or three years ago.

As is well known, epidemics of rot follow severe outbreaks of late blight on the foliage. In its most destructive phases this occurs as a soft, wet, stinking rot, but this is due to the secondary invasion of bacteria and other fungi following the attacks of the late blight fungus. The primary decay caused by this fungus is a dry rot like that shown in the next illustration. The next gives the appearance of such a tuber when cut in two. The following two are also illustrations of cross sections of tubers affected by dry rot.

It is interesting to consider for a moment how the late blight fungus is able to spread so rapidly and do so much damage when conditions are right. The next illustration throws some light upon this point. It is a diagrammatic drawing of a section of a potato leaf showing the under side. It will be seen that the leaf is made up of cells like all other plant tissues; that the cells on the two surfaces of the leaf are so modified as to form a protective layer to the spongy tissues between. The long pointed bodies projecting from the lower side are leaf hairs. The threads of the late blight fungus are light colored or almost transparent but in the illustration they have been colored so as to make them stand out more clearly. It will be seen that when the tissues become diseased the threads of the fungus penetrate in various directions through it, killing the cells and living on their contents. After a time certain threads are pushed out through the little, lip-like breathing pores on the under side of the leaves. These are to become the reproductive organs. Then the end of one of these threads begins to swell up and by and by becomes a little pear-shaped or lemon-shaped body. This is pushed to one side and then the thread goes on forming others. These bodies are the spores of the fungus, corresponding to the seeds of higher plants. They may germinate directly and infect new spots on the leaves, but if the temperature conditions are right the interior contents of these spore bodies split up into other small elements, on the average about ten, which finally escape through the rupture of the wall of the original spore. These are little, free-swimming bodies which swim about in the drops of rain and dew and finally come to rest and begin to germinate by throwing out a tube which grows into the leaf and causes a new center of infection.

It will be seen that the fungus possesses almost unlimited powers of reproduction. Each single disease spot on the leaf produces innumerable threads which bear hundreds of spores, and each one of these spores may split up into an average of ten of the little, free-swimming bodies, each capable of causing a new center of infection. These are readily transported about by means of wind, rain, dew, rubbing of the leaves together in the wind, or in working among the plants, and probably by various other agents.

This explains why it is that the disease which has passed unnoticed, or has been seen but slightly on the field, may spread like wildfire over it, destroying all the plants in a very short time if weather conditions are right. It also explains why, in spraying with bordeaux mixture, the most thorough and painstaking work is necessary, and why it is absolutely essential that spraying be begun and be thoroughly done before the appearance of blight on the field. Bordeaux mixture is a preventive of late blight and not a cure. After the spores have once germinated, and the germ tubes enter the leaves, spraying would be somewhat comparable to attempting to put out a fire in the interior partitions of a building by drenching the outside of it with a fire hose.

OTHER LEAF DISEASES.

A new leaf disease of potatoes has recently been observed in Maine, and whether or not it is of any importance is yet to be shown. This was first seen on some plants grown by the United States Department of Agriculture at Houlton last year, and appeared again on their plots at Caribou this year. I have since seen it in northern New York, and near Tacoma in the State of Washington. The two slides shown were made from material obtained in the latter state. For the lack of a better term this has been called the "Streak disease." It is characterized by a browning of the veins and tissues on the lower side of the leaf. No parasite has yet been isolated from the diseased area, yet there are certain characteristics about it which indicate that it might be of a bacterial nature.

There are a number of leaf troubles recognized by pathologists, and known by the names of curly dwarf, leaf roll, mosaic disease, etc., the nature of which is not very thoroughly understood. From a practical standpoint, however, we do know that most of these troubles are carried by the seed, and that they are pretty sure to grow worse if tubers which are grown from plants which show these abnormalities are used again for seed.

Therefore, tubers found to produce abnormal types of foliage should be eliminated from the seed stock. If the number of affected plants are few they should be dug and discarded before they set tubers. If they are many, the entire field should be sold for table stock, and a new lot of seed from a healthy field be obtained. Leaf roll has only occurred to a slight extent in Maine as yet, but it is rather serious in certain western states. On the contrary, the mosaic disease which is characterized by a peculiar mottling or calico appearance of the leaves is by no means uncommon in the Green Mountain fields in this state. With the exception of New York, I have seen it in no other of the northern or western states.

WART DISEASE OF THE POTATO.

The illustration of the worst known potato disease is left for the last. This is the wart disease, which, when it attacks a tuber, entirely destroys it and converts it into an irregular, coral-like mass in no way resembling its original shape or appearance. Once the germs of this disease get into the soil they remain there for a long time. In fact, we do not know how long it will take to free the soil from the disease. No greater calamity could befall the potato industry of America than to have this disease become established in this country, and become at all widely distributed.

SEED CERTIFICATION.

By C. R. Leland.

I am disappointed that I was not able to attend the Seed Certification meeting in Philadelphia, mentioned yesterday, so that I might have told you what other states are planning in this work. What I shall say will be only in regard to conditions in our own state—the work we have done in the past year. We have taken up at this meeting, more than at any other meeting we have held, the selling end, and it seems to me the selling end is one we must get back to more and more from year to year. We have been getting at the production,—producing more and producing better, which is right and proper, but we have left the other end, the selling end,—getting things on the market so as to bring us better prices. Our plan of seed certification is a plan which combines the two; showing us how to produce the best and giving us a cue as to marketing to the best advantage.

It might be well to mention the conditions which make certification necessary from the marketing standpoint. You know in the potato business, the states south of New York buy almost all their seed potatoes in the north. The reason for this is that with their hot, humid climate and a soil so much different from ours, it is almost impossible to grow a potato that will yield well and continue to do so one year after another. They must keep their potatoes in cold storage and usually in growing their own seed potatoes they plan a second crop late, which yields only 15 to 20 barrels to the acre, and as it is a pretty slow proposition to raise seed at that rate they come north and buy their seed from Maine, New Hampshire, Vermont and New York, and all of the northern potato growing states. Dr. Morse said last night that the potato, traveling as it does all over the country, and from Europe here and back, has collected the greatest assortment of plant diseases of any plant; that certain of those diseases we could prevent and possibly some we could cure. Those people down south are troubled with these diseases perhaps more than we are. The soil is moist, the weather is warm and they must grow the crop quickly in the season when the best opportunity for the development of disease is found. We have sent down there potatoes badly infected with blackleg, sometimes 25 or 30 per cent of the crop; we have sent down potatoes affected with other diseases, and perhaps most important of all, we have sent potatoes that are not true to type. Last winter at Caribou I saw potatoes being sorted out of one bin. The man had a barrel at one side in which he was putting Cobblers; in another barrel he was putting Green Mountains, in another barrel Norcross, and in another barrel some other variety, all from the same bin. Now the question is, what per cent of those Cobblers which came out of the same bin with the Green Mountains would prove to be early potatoes when planted in the south? They grow potatoes in New Jersey and Virginia for an early market crop. Every day they leave those potatoes in the ground after the time when they should be ready to dig, means so much loss per bushel, because the digging begins in Florida and follows up the coast line, and if it gets by them the price goes down. So they must get their potatoes on the market at the earliest possible moment, and the late varieties will not mature as soon as the early varieties. If there are late varieties mixed with the early ones, they are likely to start the whole lot down hill.

So the people in the south are interested to get potatoes for seed which have these three points,—freedom from disease, purity to type and high yielding qualities, and they will buy them where they can get these qualities. If you and I cannot furnish them, they will go to New York or Michigan, or some other state. At our last annual meeting the Seed Improvement Association voted that we undertake to make some study of the markets and that we undertake to find some plan of marketing our seed and standardizing it. These things enter into the certification of seed and we formed a tentative plan for certifying and guaranteeing seed stock grown in Maine. When powdery scab was discovered here last winter, Dr. Orton from the Federal Horticultural Board and other gentlemen from Washington and from the South, came to Maine and brought with them a plan of certification which they suggested for our adoption. We decided that it was a wise thing for us to adopt a certification plan this year. Of course we were working on small appropriations and we could not do as large a work as we wished. We wanted to be sure we were right. It would have been very pleasing to us and a great benefit to the association if we had been able to say, "Come in, we will inspect your grain, your corn, your potatoes and all crops you care to certify." But we have not asked very many people to come in because funds have not been available. We have inspected 576 acres of potatoes; 222 of these passed the standard set, and we have the seed of those 222 acres for sale,—seed which has been passed by men with a knowledge of potato diseases and with a knowledge of conditions under which the potato grows; men who have made a study of potato culture and diseases. I want to say a little more in regard to the kind of a man who should do certification work. It seems to me that he must be a man who is a good mixer, a man with a good head; not necessarily a college man, but a man who has taken time to study at the Experiment Station the particular plant diseases which are most important and which must be reckoned with in seed certification. For instance, the men who inspected for us this year went to Orono and put in from two to five days each with Dr. Morse and Mr. Shapovalov and when they went out to work they were ready when a specimen of diseased plant was found to say what the trouble was. A man must be able to do this, and he must be a good mixer, so that he may meet all sorts of people without antagonism. It is quite a difficult position to be an inspector. I was out with the boys for some little time myself and did not envy them their job in any way.

The three points which I mentioned,—freedom from disease, purity to type and high yielding qualities, will apply to other plants as well as to potatoes. Of course we will say that we must have a standard, and that is true. If we are working with yellow eyed beans, it is necessary to have a standard as to what shall be the shape, what the size and what the color markings, for that bean. I gave you yesterday in my annual report to the association, a list of potato varieties which had been grouped together according to their characteristics of fruiting and of plant growth. This list was made by a man who has been a student of potato varieties all his life—Prof. Stuart of Cornell and of the United States Department of Agriculture. Prof. Stuart has been doing experiment work with varieties for the United States Department of Agriculture, and he has made a very extensive study of the characteristics of varieties. Probably no man in the country is better qualified to set a varietal standard for potatoes than Prof. Stuart. It was the vote of the association last year that we do something towards standardization. The report which I gave yesterday will be published in our annual report and will be available to any farmer in the State of Maine who makes application for it through the Department of Agriculture.

I think that we should, as growers, take the potatoes which we know—for instance, the Cobbler variety, and we want to so set a picture of the Cobbler plant in our mind that when we go to some other town, or to our neighbor's farm, we can pick out that plant and say for a certainty that it is a Cobbler. We want to be able to recognize the Cobbler in comparison with the Sir Walter Raleigh or some other purple stemmed and purple flowered variety.

Another thing,—each individual plant has some characteristic of its own. For instance, in the Green Mountain Group we have the Gold Coin, the Carman Number 1, the Norcross and a host of other varieties, all of the one type. The individual variety in the type is not important, but we must give ourselves a type for any one group and then stick to it. The same thing is true with corn and grain. I have been speaking particularly of potatoes because we have done mostly potato certification work this year. My remarks are as true with other farm crops as with potatoes. I hope this association will continue its certification work, and that the certification work will grow and spread until we are taking in all the crops grown by all members who make a business of growing seed.

I have already said a little something about the inspection methods, and I am going to explain more in detail how we managed the work this year. We asked the men who wished to have inspection made with the idea of certification, to select the best seed available in the first place, and then to treat that seed with formaldehyde or corrosive sublimate to kill all the spores or germs or blackleg on the outside of the potato. While not an absolute cure, this treatment is of assistance in keeping down common scab and possibly powdery scab. It kills whatever diseases may be on the outside of the potato. Then we asked these men, in cutting the potatoes, to throw out all that showed disease, all potatoes which were rough or uneven and all which showed knots or knobs, because all those things are indications of disease. We asked each man to make out a report, telling us something about the soil on which the seed was grown, the conditions under which it was grown, just exactly what the seed was and how it was treated. So we have a statement from every man who entered potatoes for inspection this season. Our inspectors have visited each one of the men on the list. They visited them when the potatoes were in blossom,—as near full bloom as possible—and the reason for this is that some of the potato plants have a purple blossom and some a white blossom, and there are other variety characteristics which are most easily determined at the time of blossoming. The inspectors went through those fields carefully. Of course we had to set a standard, and we said if more than a certain number of blackleg plants appeared in a field we would not inspect it further; because if there were more than a certain percentage and we removed them all, it would cut that man's yield below profitable production and we did not wish to hurt any man. If there were more than a certain number of plants affected with other diseases, as Rhizoctonia and wilt, or more than a certain number of weak plants, the inspectors would cease making inspections. Down to the standard they removed every plant which was diseased.

The following is the standard set:

POTATO INSPECTION STANDARD.

There shall be three inspections during the season; the first, during the time of bloom, the second as late as possible before harvest, and the third, between harvest and shipment.

FIRST INSPECTION.

It shall be required that all seed planted in the seed fields shall be treated with the formaldehyde solution, or corrosive sublimate solution, to prevent blackleg and common scab. In addition, it is recommended that cut seed be rolled in sulphur.

Blackleg: More than 80 hills per acre will disqualify.

Varietal Mixtures: More than 240 hills per acre will disqualify.

Weak Plants, including Curly Dwarf, Mosaic, Wilt, etc.. More than 500 hills per acre disqualifies.

Leaf Roll: A single specimen disqualifies.

SECOND INSPECTION.

Time, prior to harvest, while foliage is still green.

Blackleg: More than 16 hills per acre disqualifies.

Leaf Roll: One specimen disqualifies.

Varietal Mixtures: More than 80 hills per acre disqualifies.

Weak Hills: 100 hills per acre shall be dug for sample. Five per cent producing conspicuously less than average yield will disqualify. (In case of doubt, check result.)

Powdery Scab: Single specimen disqualifies.

Wilt, including such diseases as Mosaic and Curly Dwarf: More than 160 hills disqualifies.

Late Blight: Amount shall be reported by inspectors, that it may be entered upon certificate.

THIRD INSPECTION.

Time, at or before awarding of certificate.

Any powdery scab causes rejection. Certificate shall state percentage of trueness to type or purity.

The grower shall agree to remove all decayed and badly damaged tubers before shipment, and to remove from seed stock all potatoes badly infested with Sclerotia of Rhizoctonia and common scab.

It is recommended that no seed stock be sold containing tubers of less than three ounces or more than ten ounces, and from four to eight ounces are recommended as the size most satisfactory.

Ques. Will soaking the pieces of potatoes after they have been cut affect the germination in any way?

Ans. That is a question which has not been definitely settled. One large grower in Aroostook county soaks his after cutting and claims to have no poor results. One man at Gardiner soaked some cut seed over night in a double strength solution and they grew just the same. Some other men claimed that this hurt the seed.

Ques. Would there be any danger of infecting healthy seed by cutting it with a knife which had passed through a diseased place?

Ans. Yes. It has been recommended by people who study such things that a man keep a common quart jar of formaldehyde solution where he is cutting, and when he cuts a diseased potato, put his knife into the jar and take the other knife from the jar, thus keeping his knives thoroughly disinfected.

I wish to say that we found only one case of leaf roll in our inspection work this year. This case of leaf roll came in seed brought from New York state.

At the time of the second inspection the inspector takes samples over the field, in different sections—some in a low place, some on a rise, for instance, and some in the center and some near the edges. When he has dug a sufficient number of samples he knows about what the yield will be, and he can tell whether any particular tuber disease is showing up or not. If five per cent of the samples dug show conspicuously less than the average yield, the field is disqualified for certification. Of course if any powdery scab is found, that disqualifies. Wilt diseases make their appearance late in August. If more than 180 plants of wilt disease are found, disqualification follows. Late blight does not disqualify except in cases where rot sets in very badly.

The third inspection is made at the time of awarding the certificate, and this, of course, is an inspection of the tubers and it is an inspection which takes into consideration the especial type of the potato and its diseases. The grower removes from the sacks of potatoes for sale all diseased and damaged stock, all stock infested with Sclerotia, etc.

The above is the plan of certification which we have followed in potato work this year. The final inspection is being done by Mr. Clark, agent of the Federal Horticultural Board and his inspectors. The tags are furnished by this association and by the Department of Agriculture of this state. The guaranty is made by the Commissioner of Agriculture and this association, and the grower signs a statement that the potatoes in the sacks tagged are only from inspected fields that have passed the inspection.

We come now to the selling end. Those people who are growing potatoes in the south demand certain things. They want to know whether they are going to get them or not, and the only way they can tell is through a guaranty. Your guaranty or my guaranty does not mean very much to a man down there, because he does not know whether you and I are honest or not, but if the State of Maine and the Department of Agriculture, or the Seed Improvement Association, or any such body of men who have a standing, give a guaranty, the buyer is bound to respect that guaranty, so that a guaranty of certification signed by the Commissioner of Agriculture and put out by the Seed Improvement Association, means something to those people. Just as soon as they find out that it does mean something and how much it means, they will pay us a premium for our seed because of the guaranty it carries.

In regard to the cost of inspection, as near as I can tell from the work done in Maine this year, it costs approximately $3 an acre to do the actual work. We charged this year a very small entry fee,—less than $1 per acre. It was on a sliding scale, in some cases a little over 60 cents per acre. The greater part of this total cost of $3 per acre was paid by the state. If this association should desire to put this work on a real business basis it would be necessary to adopt some such plan as this: A contract might be drawn up between the head of the association, whoever is doing the business, and the members. The members would agree to plant seed from inspected fields which had passed the standard and was of high quality; they would agree to treat it according to recommendations, grow it according to the best methods, inspect it and remove such diseases as make their appearance, etc. And then, to proceed in the most business-like way, it would be necessary that the potatoes grown by these men be sold by the manager or the secretary of the association. As it is this year, we have a list of all the potatoes that have passed inspection, and we are trying to find a market for them. We have inquiries and we send a letter to the inquirer, telling him where he may secure certain seed, and we send a letter to the grower, telling him who wants his seed. But the man may not report to us, all his potatoes may be gone, and we may keep on giving his name to the buyers after the seed is sold. It would be necessary to have a contract of some kind drawn up in which there should be some restrictions, that the manager should know at all times how much seed there is for sale. This plan is something which will be a little difficult to work out, but something which we must meet to bring the greatest success to our work.

We have many inquiries for certified seed. Mr. Clark tells me inquiries come to his office. I had a letter the other day from Dr. Orton, who is vice-president of the Federal Horticultural Board, stating that he had inquiries which he would refer to us. I have inquiries from the experiment stations of several southern states. They are interested in what we are doing. This certification plan has already been adopted and is in operation in one state,—I believe in Wisconsin, and it will be put in operation next year in Montana, Michigan, New York, and Vermont, I think.

We should make our plan uniform, that each state may have potatoes to sell which are standard, which are free from disease, which are true to type and which are of high yielding quality. And on the last point of excellence is where the State of Maine seed will give results comparable to all and superior to most, because the average yield of potatoes in Maine is already superior to the yield of any other state. I believe a ten or fifteen per cent increase in average yield may be easily secured, along with more uniformity in type and a greater freedom from disease, following a general adoption of methods as I have tried to outline to you.

Gentlemen, I thank you for the attention and interest you have shown.

Mr. Lowell: It seems to me there ought to be some standard of value upon certification.

Mr. Leland: If the seed was all sold by one man, that man would know what price to put upon it. At the present time the value to Mr. Porter, for instance, is what he can get in addition to the regular market price. Perhaps the other fellow can get a little more or not so much.

Mr. Lowell: If a man comes to me and wants to buy a lot of certified potatoes, I am going to sell the potatoes; I know that there is somebody else who has certified potatoes and I am afraid if I do not put down the price pretty well he will go over to the other fellow, and that man would sell a little cheaper. I think it would be well to find out in some way about what this certification is worth.

Mr. Leland: It ought to be worth somewhere about ten cents per bushel and it costs about one cent. As I understand it, in the State of New York they have a very bright young man who is taking up this work very enthusiastically. Instead of going into the matter in a hurry he is taking plenty of time and doing a lot of figuring and he estimates that it costs about one cent a bushel. It seems to me that we should charge not less than 10 cents a bushel over the regular market price.

Mr. Porter: It seems to me that ten cents a bushel would not hold out very much inducement to any one. I have had dealers write me and say, "If you can furnish me a carload of potatoes like the last one, for consumption, I will give you ten cents a bushel above the market." That is not enough, in my opinion, for certified stock.

Mr. Leland: I want to say right here that I wish there was not a bushel of certified seed in the State of Maine going outside of the state. I wish that every bushel was going to be planted on our own ground. It would be the best thing for us to do. But the man who has a little better product than his neighbor is shipping it out because he can get a better price. He will save enough for his own use but we do not always like to help our neighbor as much as we ought. If we should plant every bushel of these potatoes right here in the State of Maine it would not be long before we would be in the same condition as they are in the seed-growing and clover-growing sections. In Canada they passed a law in 1904 and again in 1906, which prohibited the planting of certain grades of seed. The seed must be up to a certain standard. There were a few prosecutions and then the people planted seed which was good. But I am sorry to say that in the Canadian Commissioner's report last year the statement was made that the lowest grade almost entirely goes to the United States. It was not very pleasing to learn that the lowest grade of clover seed growing in Canada comes to the United States. We have done quite a lot of work with grain. We have for sale about 40 acres of certified oats yielding an average of 50 bushels to the acre. We have some corn which has been grown under inspection and very carefully bred, and it is true to the type of variety to which it belongs. We shall be pleased to sell this seed at a high price, and to do that, we must all help.

LIME AND ITS USES.

By Dr. H. J. Wheeler,
Formerly Director of the Rhode Island Agricultural Experiment Station.

INTRODUCTION.

It is a most remarkable circumstance that the use of lime remained so long neglected in the United States. Twenty years ago its employment in an agricultural way in this country was confined chiefly to a few localities in New York, New Jersey and Pennsylvania, where its agricultural value was demonstrated chiefly by the early German settlers. Lime had also been introduced here and there by English and Scotch immigrants who had learned of its value in their home countries. In certain sections of Virginia the use of native lime marl was earnestly advocated for a time by Ruffin, although it subsequently fell into general disuse.

During all this time the farmers over parts of Rhode Island, Massachusetts, eastern Connecticut, and certain sections of Vermont and Maine, were applying manure and fertilizer to their land, and were often securing but meagre harvests because of a lack of enough carbonate of lime to maintain the soils in condition to properly support plant growth.

In parts of certain counties of the State of New York farming became considerably decadent solely or chiefly because of the existence of excessive soil acidity which was destructive to clover, timothy, and barley. It also greatly lessened the yields of wheat, oats, Indian corn, and other crops.

It is stated by Director Thorne of the Ohio Experiment Station (Bul. 260) that clover cannot be grown successfully on a soil which is deficient in lime, "and on thousands of acres in eastern Ohio clover is making a weak and sickly growth or is failing altogether because of this deficiency, and as clover fails, the yields of other crops become more irregular." He says again that liming should have been the first step after drainage, as no combination of fertilizers or manures has produced a full crop until lime has been added.

Liming has also been found to be vital to successful agriculture in southern Illinois, in certain parts of Pennsylvania, New Jersey, Maryland, and in many other states of the South and Middle West.

In Virginia, liming has been found to be of great importance on the soils of the Coastal Plain, the Piedmont Plateau, and on occasional soils of the Appalachian region. The interest in the subject of liming has become so great in Virginia that the railroads have made great concessions by way of reduced freight rates. The legislature and the governor have taken an active interest in bringing about the more general introduction and use of ground limestone.

This matter of liming, as Whitson and Weir of Wisconsin express it, "is not a Twentieth Century fad," for lime was employed on land by the Chinese long before it was used by the early Romans. Liming in this country is, therefore, a resurrection and application of an old idea to new lands.

HOW THE NEED OF LIME CAN BE DETERMINED.

Several methods are now in common use in chemical laboratories for ascertaining the lime requirement of soils, but these are too complex and difficult to permit of their employment in the field or usual farm kitchen.

The most reliable of the simple tests is that afforded by the use of blue litmus paper. For this purpose one should preferably use a soft paper rather than some of the hard, partially faded papers often found in drug stores. Fill a cup half to two-thirds full of soil and add water in successive small quantities until, after thorough stirring, the whole mass is about like thick mortar. Then part the soil with a knife, insert a narrow strip of blue litmus paper, and press the soil back against the paper. If, after standing a few hours, the blue of the paper has entirely disappeared and a red or slightly pinkish-red color has taken its place, it is probable that the land needs lime.

Another simple test is the "Ammonia Test." Take a rounded tablespoonful of soil and place it in an ordinary tumbler. Fill the tumbler from half to two-thirds full of water and add a teaspoonful of dilute ammonia water, such as can be secured from any druggist. (One should not attempt to use in its place the ordinary household ammonia, sold for cleaning purposes.) Stir the mixture ooccasionally during the first hour or two. If, after a few hours or by the next morning, the liquid has taken on a reddish-brown, dark chocolate or black appearance, it is an indication that the soil contains a considerable amount of organic matter which has not been previously neutralized by lime, for where such neutralization has taken place, ammonia will give only a slightly colored extract. This test cannot be depended upon in the case of sub-soils, and it has far less significance in connection with soils which are quite deficient in organic matter.

If the litmus paper shows a high degree of acidity, and a copious, dark or black extract is obtained in the ammonia test, the probability is great that lime must be applied in order to give the best results with most agricultural crops.

KINDS OF LIME TO APPLY.

In the case of heavy clay and silt soils which bake badly when they become dry, and which are rich in acid vegetable matter (a fact which would be indicated by securing a black extract with ammonia water), ground, burned lime, air-slaked or water-slaked lime may be used, provided they can be secured at economical prices. In the case of all other soils, particularly if they are light, sandy or gravelly, or inclined to be occasionally dry, finely ground limestone is preferable to any of these other forms of lime. This is for the reason that no immediate ill effects follow its use, whereas, if the other form of lime are applied in any considerable quantity to soils of a naturally dry character, occasional serious ill effects are noticed, which may endure throughout the first season.

Ground limestone is a favorite form to apply because it is mild instead of caustic. Other forms of lime, because of their caustic or burning character, are very disagreeable and dangerous when they get into the eyes of the horses or workmen. They are also more powerful in their immediate destructive effects upon the soil humus.

GYPSUM OR LAND PLASTER CANNOT TAKE THE PLACE OF CARBONATE OF LIME.

In ordinary gypsum or land plaster, the lime is very largely present in combination with sulphuric acid, on which account it cannot correct the acidity of soils as slaked lime and ground limestone do. In rare cases where the soil is naturally moist or remains very wet for long periods of time, the sulphate of lime in land plaster may be partially changed into calcium sulphide. Later this may be changed by the carbonic acid in the soil or by that brought down in the rain water, into carbonate of lime. In this case the sulphur escapes into the air in combination with hydrogen in a gaseous form. After these changes the residual carbonate of lime would have a tendency to lessen the acidity of the soil. Superphosphates and complete fertilizers which contain sulphate of lime may, under similar conditions, have the same effect.

AMOUNTS OF LIME TO APPLY.

In very rare instances, as, for example, in the case of heavy soils which are excessively rich in acid organic matter, which yield black extracts upon treatment with ammonia water, and which redden blue litmus paper, quickly and intensely, from four to five tons of ground limestone may be required to the acre. On soils which are moderately acid, and which contain less organic matter, from two to three tons are usually sufficient. In general, two tons to the acre will correct the condition of most New England soils sufficiently for the satisfactory growth of most ordinary farm crops.

If a soil is exceedingly light, sandy or gravelly, and is deficient in organic matter, a ton to one and a half tons of ground limestone will sometimes answer for the present. In the case of those heavy clay soils which bake badly, and which are rich in vegetable matter, one may apply as high as from two to three tons of slaked lime to the acre or from one and a half to two tons of finely ground, burned lime. Owing to the caustic effects of burned and slaked lime, on account of which it is more destructive to organic matter, and more likely to cause injury to crops the first season, finely ground limestone is usually preferred, for all ordinary soils.

WHEN AND HOW TO APPLY LIME.

For the improvement of pastures, ground limestone may be applied at any time during the late fall or winter months, if there is not a covering of snow on the ground, and provided there is no danger of its being washed away and lost. Otherwise, it should be applied as early in the spring as possible or during the early autumn. Frequently a single application of ground limestone, applied in this way, will bring in an abundance of white clover and vastly improve the value of pasture land. In the case of land which is plowed in the late autumn, the ground limestone may be spread at once or, if the land is so level that washing need not be feared, it may even be spread during the winter. It is always important to bear in mind the economy of labor and the desirability of doing as much work of this kind as possible in the winter months when other farm work is not pressing. If ground limestone cannot be applied in the winter, it can at least be shipped and hauled home on the snow.

An excellent time to apply lime is just before seeding land to clover and grass. This is particularly true when the grass and clover seed are sown with winter wheat or in the spring with barley, for these crops are more in need of lime than oats, which in turn require it more than rye.

If ground, burned lime, air-slaked lime or water-slaked lime are used, it is always desirable to apply them with a lime spreader, taking care to drive in the direction from which the wind is coming in order to keep it out of the horses' hair, and out of the eyes of the horses and workmen. These forms of lime should always be thoroughly harrowed into the soil immediately after their application, in order to avoid lumping and consequent loss of efficiency. Ground limestone can be applied by spreading it from a stone drag, a low gear, or cart, or from heaps on the ground, but wherever it is possible, it should be distributed by means of a suitable fertilizer or lime spreader.

The most important point is to have the ground limestone evenly distributed so that a particle of it will come as nearly as possible in contact with every particle of soil. Even distribution is greatly furthered by harrowing the land once after it is plowed, and then sowing the lime, and harrowing it in. This is for the reason that more even distribution can thus be secured than where the lime falls between the furrows, which it may do, if the furrows lap and stand somewhat erect. On lands which can be plowed, far better results will follow the use of lime after plowing, as mentioned above, than by merely using it as a top-dressing, but for pastures this is seldom feasible.

THE EFFECT OF LIME ON THE PHYSICAL CONDITION OF SOILS.

Attention has already been called to the benefit from liming clay soils which bake badly. This is due to the fact that the lime causes several small particles of such soils to unite and form single larger ones, thus making them much more open. On this account the rainwater passes into the soil and can rise again more readily as the crop needs it, whereas, otherwise, more of it would tend to flow off the surface and thus be lost to succeeding crops. Another advantage of liming such soils is that it enables the air to gain access to the roots, for if this movement becomes greatly restricted, agricultural plants fail to thrive normally.

It is generally true that soils which have been limed can be worked earlier in the spring. They also exhibit a better condition of tilth than acid soils which have not had such treatment. In the case of sandy and gravelly soils, ground limestone has a tendency to improve their physical condition by making them more retentive of moisture and organic matter, and less subject to loss of plant food by leaching than before.

EFFECT OF LIME UPON THE MICROSCOPIC ORGANISMS OF THE SOIL.

It is now well known that certain soils contain organisms which can assimilate nitrogen directly from the air, and the growth of these is favored by liming. It is also known that there are still other organisms which tend to destroy nitrates, when once formed, changing a part of their nitrogen into organic forms, and sending the remainder into the air as gas. These on the other hand are rendered less active by liming.

Most of the nitrogen taken up by plants is assimilated in the form of nitrates, although some of them can, under certain circumstances, probably use some ammonia as such, and perhaps also small quantities of soluble organic nitrogenous compounds. It is nevertheless true that if one wishes to render manures and fertilizers most highly available to plants, such conditions must be created in the soil as promote the formation of ammonia, and its subsequent change into nitrous and finally nitric acid, in which latter form plants actually take up most of their nitrogen. These changes are all promoted to a high degree by carbonate of lime.

Certain of the leguminous plants which gather nitrogen from the air will thrive on exceedingly acid soils. Typical illustrations are furnished by the serradella and certain of the lupines. The cowpea, soy bean and vetch will thrive well on soils which are moderately acid, whereas clover and alfalfa require soils which are more nearly neutral, slightly acid, or perhaps slightly alkaline. It is not known, nor does it matter, whether the liming is beneficial to the clover and alfalfa in such cases entirely apart from its effect on the micro-organisms which cause the nodules to develop on their roots, and which enable them to secure nitrogen from the air, or whether liming is vital to the micro-organisms and hence, indirectly, to the plants. The important fact is that many soils in New England have become actually clover sick and alfalfa sick to such an extent that these plants either die or produce only a partial crop until the land is limed, entirely regardless of how generously the crop is fertilized.

EFFECT OF LIME ON PLANT DISEASES.

There is no longer any doubt about the influence of lime in connection with many plant diseases. In Porto Rico, Gile found that the heavy liming of sandy soils interfered with the pineapples' ability to secure the necessary amount of iron, with the result that serious chlorosis of the plants developed. Treatment of the soil and leaves with iron salts corrected the condition, for the iron was then assimilated sufficiently to meet the plants' requirements.

Heavy liming in certain sections of the Connecticut Valley in Massachusetts and Connecticut has sometimes led to the development of the so-called "tobacco root rot."

In Germany a disease of oats known as "dry spot" has been found, occasionally to follow heavy liming, and a disease or physiological disturbance showing similar effects has been noticed by the writer in occasional years in Rhode Island. In the latter case, its occurrence seemed to hinge also upon the weather conditions, for it was noticeable only in occasional seasons.

The work of the agricultural experiment station in Rhode Island, covering a period of four years, showed most conclusively that if the microscopic organisms which cause the common potato scab are present in the soil already or are on the "seed" tubers which are planted, the presence of carbonate of lime in the soil is a most powerful factor in promoting the development of scab. It was further shown by using various salts of sodium and potassium that this result was due to the creation of a more nearly neutral or alkaline condition of the soil and the scab organisms were found to be particularly active in such cases, regardless of whether the neutrality or alkalinity was caused by soda, potash, or lime.

It is also true that when soil becomes excessively acid, this condition lessens to some extent the total yield of potatoes, and in a striking degree the percentage of tubers of ordinary marketable size.

From what has been said it will be obvious that one should always avoid the use of excessive and unnecessary amounts of lime on land where potatoes are to be grown in later years. If potato lands are limed, the application should be made following the crop so as to allow as much time as possible to elapse in the rotation before the next crop is grown.

In all cases where potatoes are raised on land which is known to be ideally adapted to the crop at the outset, it is to be assumed that the soil is no more than slightly or moderately acid or that it may be even alkaline. Such being the case, one should never omit treating the "seed" tubers with formalin or corrosive sublimate solution before they are cut and planted.

In 1912, the writer has the opportunity of seeing a crop of potatoes harvested from some strips of land across which scabbed potatoes were planted in 1893 and 1894 for experimental purposes. It was possible to tell by the occurrence of scab where the scabbed tubers had been planted previously, although eighteen years had elapsed, and no potatoes had been grown there during the interval. This shows that the germs of the common potato scab can live for years in a soil on the decaying vegetable matter or that they at least remain active for the entire time without having a potato crop to feed on. The lesson from this is of vast imprtance to a potato-producing state like Maine. In fact there ought to be, if there is not already, a state law which would prevent the planting of untreated "seed" potatoes.

The only economic recourse, if a soil is favorable to scab, is to use properly compound acid fertilizers. Flowers of sulphur will accomplish the same result, but they do not at the same time fulfil the other functions of the complete fertilizer. If flowers of sulphur are used, the "seed" tubers, when cut ready for planting, should be rolled in them, and sulphur may also be scattered in the drills in quantities ranging from 300 to 600 lbs. to the acre. Another drawback to the sulphur treatment is the extra cost of the material, which is a serious item, particularly in a year when the "bottom drops out" of the potato market.

If you ask what the effect of liming will be on the powdery scab, I regret that I cannot answer. This is a point which your experiment station is no doubt studying, and concerning which it can soon inform you. It is to be hoped that highly acidic conditions are also destructive to the powdery scab germs, for if they thrive best in very acid soils the potato industry will surely soon be between Scylla and Charybdis, unless the greatest precautions are taken.

SOME INDIRECT CHEMICAL EFFECTS OF LIME IN SOILS.

Much has been written recently in the agricultural press concerning the ability of lime to liberate potash from soils. Some of these statements have been moderate, whereas many have been much overdrawn. It is no doubt true that where soils have been fertilized generously with potash in recent years, the use of lime will add noticeably, for a time, to the quantities of potash which plants can take from the soil. This is due to the fact that lime enters certain compounds replacing potash, which then passes into solution in the soil water or is held in the soil in such a physical state as to be more readily available than before. It is obvious that an end to such a possibility will soon be reached, for there will not be sufficient potash remaining in these readily decomposable compounds to be liberated to any practical extent, surely without such excessive liming as would be uneconomic and wholly unwise for various reasons.

Furthermore, most of the potash in soils is present in such combinations that lime would have no practical decomposing effect upon it. In my earlier experiments on a soil of granitic origin which contained quite high percentages of potash, most of it was in forms decomposable with such difficulty that the deficiency of available potash after lime was applied was almost as great as when it was omitted. Here was a soil derived from rocks, rich in potash feldspar, from which repeated cropping for several previous years, with little or no use of potash, had resulted in taking out the potash from the more easily decomposed zeolitic compounds, until lime could liberate but little more. Unfortunately, many soils in New England have been brought into the same condition by tenant farm robbery or by neglect to return some part of the potash which has been removed. On such farms but little can be hoped for in a practical way by attempting to set free potash, for the crop, by liming. This is, therefore, truly a year when the wise husbandman will reap his just reward for past liberality to his soil.

Carbonate of lime has been shown by many experiments in this country and Europe, to promote the formation of ammonia and nitric acid in the soil; changes which most of the organic nitrogen of farm manures, green crops, and commercial fertilizers must undergo before it is fully available to plants.

It is also true that carbonate of lime aids in the maintenance of soil conditions which tend to prevent the destruction of nitrates after they have been formed within the soil or have been applied in fertilizers.

In cases where soils are very rich in iron and aluminum oxides and are acid, much of the phosphoric acid is in such combination with these oxides that plants cannot make much use of it. Generous liming in such cases corrects the unfavorable acidity and results in the liberation of considerable of this locked-up phosphoric acid. If ground limestone is present in the soil, the phosphoric acid applied in fertilizers is kept in the soil in forms which the plant can utilize later on instead of its becoming quickly and quite completely unavailable.

Recent investigations at the Indiana Experiment Station showed that soils which were well supplied with all of the necessary elements of plant food in available form, including an abundance of nitrates, would not produce crops satisfactorily until they were limed. The fault was that the nitrate was present as aluminum nitrate which was found to be poisonous to plants. Liming broke up this compound, resulting in the formation of nitrate of lime which was an excellent plant food.

LIMING AND CROP ROTATION.

The point in a crop rotation where lime should be applied is after and never before a potato crop.

Lime should be introduced in short rotations before the crop or crops most likely to be benefited by it.

In long rotations the application may be divided into two parts, provided if potatoes are not raised and crops are to be grown in the middle and at the end which respond greatly to liming. In such a case half of the total amount should be applied before each of these two crops.

It must be recognized that even ground limestone promotes a reasonable amount of decay of vegetable matter. In fact, this is just what is desired. In recognition of this, however, provision must be made, by the use of stable manures, green manures, or by turning under heavy grass stubble, occasionally, to replace or augment the supply of such organic material in the soil. In this respect the short rotations often practiced in Aroostook county, Maine, and in the Middle West where the land is left in clover and timothy only one or rarely two seasons, are far less calculated to maintain ideal conditions of tilth and an abundance of humus than when redtop is also used, and when the grass is top-dressed and allowed three years in which to develop sod.

LIMING OFTEN HASTENS CROP MATURITY.

If a soil becomes so acid as to be only partially suited to a crop, its general development, the flowering, and the seeding are usually delayed. The same result is noticed when a part of a field is left without fertilizer, for the plants then seem to delay similarly in the apparent effort to still get enough food before the close of the season to fulfil their mission of abundant seed or fruit production before they die.

In some cases the writer has noticed that Indian corn matured from a week to ten days earlier on a limed than on an unlimed portion of the same field, a feature of great importance where early autumn frosts occur.

One of the most striking illustrations of this is afforded by the onion crop. It will sometimes ripen two to three weeks earlier and also give a much larger crop when lime is used. It must not be inferred that other causes will not also delay the maturity of the onion, for this will happen if there is a serious lack of any one of the essential elements, although a lack of lime and failure to use a fertilizer with a high percentage of soluble and available phosphoric acid are usually the chief causes of thick necks, and of this delay in ripening.

CONCERNING MAGNESIAN LIMESTONE.

It is universally recognized that magnesia is essential to plant growth and that no other substance can wholly take its place. According to Hilgard and Loew, magnesia acts as a carrier of phosphoric acid in the plant, a fact supported by its abundant presence in oily and starchy seeds. It has also been shown by Reed that a rather definite relation seems to exist between magnesia and the formation of vegetable oils.

There can be no escape from the conclusion that magnesia is concerned in the most important synthetic or "building up" processes of the plant. It seems to be true that occasional soils are so lacking in magnesia that its application is helpful by virtue of the direct plant food functions which it is able to perform. In the course of my experiments with it in Rhode Island it was occasionally noticeably helpful even when ample lime was used.

A few years ago, Loew called attention to the fact that some soils contain already relatively high percentages of magnesia, and that in such cases if lime is deficient, the magnesia may have a poisonous action. Unfortunately, he and some of his pupils and assistants appear to have made altogether too much of this point, as has been recently shown in Germany, by Gile in Porto Rico, and still earlier by Wheeler and Hartwell in Rhode Island.

It must be remembered that all magnesian limestones carry lime as well as magnesia, and hence there need be no fear of immediate ill effects from magnesia, even when ground magnesian limestone is employed. It may, nevertheless, be a wise precaution on soils already containing an excess of magesia, either to use a limestone carrying only a small percentage of magnesia or else to alternate by applying a pure limestone between every one or two applications of the magnesian limestone. Probably a very low percentage of magnesia in the limestone will meet any possible need of magnesia which may exist in any of our soils.

Certain speakers on the subject of limestone in the central states have advocated the use of material in which the coarsest particles were essentially the size of peas, claiming that if such material were used, there would be enough of the finer material to meet immediate necessities, and this coarser material would become available rapidly enough to maintain the soil in proper condition subsequently. Nevertheless, the recent work at the Rhode Island experiment station, covering a period of two years, has shown that the crop losses where there is a serious need of lime are so great the first year or two when coarse limestone is used that it is far better economy to apply a sufficient quantity of finely ground limestone at the outset to correct the acid condition of the soil satisfactorily.

THE LIME REQUIREMENTS OF DIFFERENT CROPS.

Among the cereals barley needs liming slightly more than wheat. This crop in turn needs it much more than oats, and oats more than rye and Indian corn.

Among the grasses, timothy and Kentucky blue-grass are often greatly helped by lime where Rhode Island bent and redtop thrive splendidly without its use. Orchard-grass and meadow oat-grass also respond favorably to liming.

There is probably no subject connected with the use of lime concerning which there are more popular misconceptions than regarding its effect on the legumes. The agricultural press is filled with statements that "the legumes are all greatly in need of lime" or words to that effect. It is nevertheless true that the serradella and certain of the lupines are often injured by lime, even for two or three years after its application. It is also frequently true, at least of caustic and slaked lime, and of preparations containing them, that yields of cowpeas and soy beans are lessened the first season that they are used, although the crops may show benefit in subsequent years.

Vetch will thrive even on soils which are quite acid, although liming is usually helpful to it. It has, therefore, a far wider range of adaptability than clover and alfalfa, which tend to disappear altogether when soils become exceedingly acid.

Another illustration is afforded by beans, for even when a soil is so acid that hardly more than half a crop of the golden wax or green-podded string beans can be obtained, the horticultural pole beans are helped but slightly by liming, and the lima beans not at all.

Among the small fruits the cranberry, blueberry, and blackberry show no response or in the first two cases positive injury from liming, whereas, under the same conditions the Cuthbert raspberry, currant and gooseberry are greatly helped. The strawberry also requires but little if any lime.

Among trees lime should not be used for the Norway spruce. The common white birch does not need it, whereas the American elm and linden respond to it most favorably.

On soils where little or no lime is needed for peaches, apples and pears, the quince, cherries, and plums respond remarkably.

Among the vegetables, lettuce, spinach, onions, beets, and upland cress are most seriously affected on quite acid soils. Perhaps next in order come cantaloupes, cauliflower, cabbage, Swedish turnips, and many other closely related plants. In fact, there are but few of the vegetables which are not somewhat helped by liming on quite acid soils.

Ques. What does lime cost in your state, f. o. b.?

Ans. I should not dare to answer that question. I know that it can be bought probably in Western Massachusetts and perhaps in Vermont, for about $1.50 per ton, f. o. b., in bulk. Of course if it is bought in bags, the bags raise the price. What it will cost you here will of course depend on the point where it can be secured and the freight rates. I understand that the Boston and Maine Railroad has granted quite favorable freight rates on carbonate of lime. The New York, New Haven and Hartford has also granted some concessions.

Ques. Is our Rockland lime all right?

Ans. I know they put out a mixture of ground limestone and slaked lime, as an agricultural lime, which is much better than hydrated lime.

Ques. Is that the form best adapted to our work?

Ans. It is best adapted to heavy clay soils but not to lighter soils.

Ques. In regard to the field that retained the scab for 18 years, if a crop of clover had been plowed in would the scab have remained?

Ans. A coarse stubble was plowed in. I do not care what you turn in, you will find the scab will be there doing business years and years afterwards. That is why I say that the future of the potato industry demands that you pass a law forcing every man to treat seed tubers as he puts them into the ground.

Ques. Do you know about the lime of the Edsom Cement company?

Ans. I think they are selling a straight ground limestone. Whether they sell other products I do not know.

Ques. In regard to plowing clover in, some of the dairymen here think it is better to cut the second crop and feed it to the cows. They think it is worth too much for feed for cows to turn under. What do you think about this?

Ans. I quite agree that wherever it is possible, here in New England where the roughage is so valuable, we should feed the clover to the cows.

On some old soil in Rhode Island which, after growing four or five crops of Indian corn, would only produce a crop six inches high and in using an ordinary amount of commercial fertilizers you could get only 60 bushels of potatoes and 15 bushels of corn, after liming it and practicing a three years rotation we are now able to get 380 bushels of marketable potatoes and as high as 60 to 91 bushels of shelled Rhode Island Cap corn. That means a wonderful improvement and I believe one of the great troubles with all the middle West where they cry for more humus is that they have been practicing a short rotation. If they had kept on one year more and had put clover with the timothy they would have had an enormous amount of humus. You can build up a soil without any stable manure at all if you run about three years in six that kind of a mixture of clover and grass. I will admit there is a difference between the dairyman and the potato farmer. The dairyman who is making enough profit on his milk is doing all in feeding the clover. The potato farmer is probably doing all right in plowing it in.

COW TEST ASSOCIATIONS.

By W. C. Stetson, Waterville.

(Stenographic Report.)

I regret that Mr. Hugh Fergus, whose name is upon the program, is not able to be with us this morning. I am very much interested in cow test associations, having been connected with a cow test association for three and one-half years, which has been in some respects one of the most successful in the state; for one reason, the interregnum between the outgoing and the incoming officials has been very short. The tester's position has always been filled very soon, and with men who have been more than fairly acceptable,—who have been interested in the work. I wish I might impress upon any one who is not acquainted with the cow test association work, the real benefits of that work. If you wish to get something a great deal better than I shall give you, I would refer you to the report of the Agricultural Department of last year, in which there is a speech by A. E. Hodges, which was of such an excellent nature that our Dairy Instructor, F. S. Adams, when at Chicago, took occasion to quote at length from it, giving Mr. Hodges due credit. Mr. Hodges is a rising young breeder who has been president of the Waterville Cow Test Association.

The advantages of the cow test association ought to be apparent to everybody. But principally, I think, the reason that justifies the organization and continuance of the cow test association is a commercial one. All business, of every sort, needs some kind of book-keeping; and while you may talk as much as you please about the ordinary farmer keeping books, you will talk about something that is an absolute impossibility at the present time unless there be some simpler method of keeping books than has yet been invented. But in the official tester of the cow test association we have a man who has been trained at the Agricultural College in respect to those things that are necessary to be done, both in book-keeping and in other things of which I shall speak later relating to the dairy herd. First, this is a system of book-keeping with every individual cow, showing both the debts and the credits so far as the feed is concerned. Of course it ignores that which a man ought to be able to attend to himself,—the cost of care, the investment in the plant, etc., but for a sum which is very much less than we should have to pay an expert book-keeper, our books are kept with every individual cow for the year, month by month, and also at the end of the year a balance sheet is made up which shows the loss or profit, and just the amount of loss or profit that is made both on the individual cow and on the herd for the year. This enables a man to weed out his herd, turning his boarders for beef, or those cows that are not absolutely boarders, but do not pay a profit large enough to justify keeping them because of the overhead charges,—the investment, depreciation, labor, etc. It also enables him to improve his herd, by keeping his best cows and by raising his heifers from the best cows, and also by buying cows to replace those that have been sold. So that in a very short time, two or three years, a man's herd may be made, through this system, if the man himself has any business capacity, to double his profit.

A second advantage of the cow test association is that very much better feeding methods are put into operation. Now there are very few men who have been connected with one of these associations, even if they have been members of this dairy organization from its beginning, who have any adequate conception of the proper balancing of feed rations or the proper feeding of cows after the rations have been balanced. I know that there are dairymen who were members of this association for years, and who, after being members of a cow test association for a year, have largely increased their profits. One man with a herd of 30 cows so eliminated his poor cows and replaced them with good cows that the second year his profits were over $400 more than they were the first year, and $400 is quite an increase of actual profits for the ordinary dairyman, or in fact, for a good dairyman. This is what the official tester, who, as I understand it has already been trained at our State College in methods of feeding, can accomplish for a man who will listen to him and who will watch his cows and put into operation the principles which he has learned.

A third advantage that may accrue to a member of a cow test association is the coming together of its members in regular meetings. Some are held quarterly, some monthly, and in some associations hardly any meetings are held. The Waterville Dairy Improvement Association has had them every month and with very few exceptions they have been successful. The advantage of these meetings is, first—I do not know whether to say least or greatest—that we talk over these things among ourselves, including the tester, ask questions of each other and if we have learned anything by the way of actual experience that is harmful in practice,—or if we have made a mistake—we tell of it if we are honest and want to benefit the association; and then, again, we learn the best feeding methods and the best records of herds and cows in our association, thus giving us an impetus and an inspiration as well as the real knowledge. I think the best part of it, however, is the fact that almost always we have speakers furnished by the Agricultural Department or by the extension course of our State College, whose lectures, many of them, would be worth going miles to hear. There are some speakers from the College who have been frequent visitors to our association. Prof. Simmons has come again and again. Prof. Corbett has been with us once and I presume he will be with us again. We have had such men as Mr. Deering, Mr. Adams, Mr. McIntire and Mr. Pope of Manchester, all those good men who have been doing things and telling us how to do things. A young fellow from the firm of Waterman & Sons came to our last meeting. He is a son, and I believe he has had a little experience at the College. At any rate, he has had experience at home and he told us how he did things and our people asked him questions. He told us just the things our people asked for, and so we learned something even from such a young man as he. Dean Merrill has been with us two or three times since our organization.

We have had members of our association who did not know anything about dairying when they joined, and they have made good progress. One young man I noticed secured a score of 95 on his print butter exhibited here, and another young man got the prize at 97½. That is what our dairymen are doing because of the work of the cow test associations and because of the work of the State College. One man, a neighbor of mine, was not a very good farmer, and not a very good dairyman. He was a milkman and fed his cows bran and gluten and if he wanted to make a change he fed gluten and bran, year after year. I worked with him a long time and got him to join the dairy association, and now he is one of the best dairymen and one of the best farmers on a small scale in the State of Maine, because of three years of this kind of tutoring, that we get by the demonstration work and also by the cow test work and the lectures that we get at those meetings. You know that this is the best thing in the world for dairymen, and I am not going to tell you anything more about it. Some of you may be called to organize a dairy testing association and you say, "Oh, we cannot do it!" Of course you cannot; no man who says that can. We met in Waterville, a few of us, and organized and elected the speaker as president, and R. O. Jones of pure bred Jersey fame as treasurer. Prof. R. W. Redman was with us and he came to our meetings for two or three months. We subscribed 159 cows at $1.50 apiece and that would not pay the bills for the year, and so we got together and I asked the members what they were going to do about it. They discussed the matter and said, "We would like to do it but we cannot because we haven't money enough and don't see where it is coming from." Prof. Redman said he was sorry the meeting was taking that course as he thought the best thing for them to do was to form an association. Then it came the president's turn, and I said to them, "Gentlemen, the way to do a thing is to do it, and to begin to do it now. There is one thing we can do. We have 159 cows pledged, and if we are willing to pay for 159 cows at $1.50, whether we have the whole year's work or not, we can start in, and when we have to leave off we will, but we will not before."

They agreed to this and we sent for a man and have kept up the work three years last May and have paid our bills. We have a man who is working hard for us. We sometimes lose a herd, because we have members that do not learn one single thing. One man whom I have in mind was a member of the association for a whole year and when he got through he did not feed his cows any better than he did before. He dropped out, of course. What was the use of staying in? He could not learn how to feed cows and he would not feed them if he knew how. But we have a live man in his place. So I say that an organization can be effective, but it needs one man who will put some time into it and will go around and notify his neighbors, who will take his horse and go off for miles. The second month our tester said he hadn't enough to do. I said, "I will get enough for you to do." I harnessed my horse and picked up six or seven days' work for him, in one day. Any man could have done it who would take his team and take the time. If you have one man who will say that this thing shall be done you can organize a cow testing association and after you have run it a year or two you will not want to drop it. But there is a difficulty, which is this: The dairy associations of the state have not been able to pay the official tester such a salary as will command the services of the right kind of a man; and when I say the right kind of a man I do not mean a man big enough tô be president of the United States or even Dairy Instructor. It is difficult to get men because of the fact that the secondary schools are putting in agricultural courses and they take for instructors the graduates from the college and pay them a thousand dollars a year or more. And the farm demonstration work takes the class of men that we would like to have and they are paid twelve or fifteen hundred dollars. Now and then we can get hold of a good man and keep him. He gets with us $35 a month and board and as much more as he can make. If he is smart he can make more. I presume the difficulty in securing a good man is the reason why some of the associations have been discontinued. I presume that will happen to us one of these days, but it will not as long as we gan get a man at the salary we can pay. I would like to say that if this state had interest enough in the dairy business to put enough money into the cow test association work, above what the ordinary dairyman is able to pay, to make the salary of the tester adequate, it would do wonders in the advancement of the dairy interests of the State of Maine.

Ques. If a cow is not in the advanced registry test, do you find that it is best to feed all that cow will eat, for grain?

Ans. No, I do not think it is. The champion Jersey made a wonderful record for butter fat but if her butter fat had been sold at the market prices she would not have paid her board. Of course there is a medium.

MR. HOLSTON: I think the impression that a great many dairymen get is that you had better give a cow all she will eat of grain. They get it from the people who are feeding for high records. I think that is one thing that ought to be talked down among dairymen.

MR. STETSON: Any one who reads Hoard's Dairyman or any other good paper will find that it is not stated that you should feed a cow all she will eat of concentrates. They may say that they usually feed a cow all the roughage she will eat. They mean all she will eat right away. They do not mean that you shall feed a cow what she will dawdle over 48 hours. I do not claim that I am an expert feeder. I feed my cows all they will eat right up clean, of roughage, and I feed a balanced ration. If you cannot balance it yourself and haven't anybody at hand who can do it, buy a Unicorn ration; but you can buy just as good material as they put in and you know what you are buying, and you can mix it according to the formula that can be obtained from the State College. And then if you will make this as a standard,—to feed one pound of this concentrate in addition to your roughages to $3\frac{1}{2}$ pounds of milk if it tests 5 or 6 per cent, or one pound to four pounds if it tests 3 or 4 per cent, I think you will be somewhere near right. Then you want to do another thing, which usually comes in to the cow test association, though not necessarily, and that is to weigh at every milking the milk of every cow and write it down just as soon as you weigh it. Study that sheet and try your individual cow by increasing the amount of grain that you are feeding by half a pound for three days, and if she answers to it increase another half pound for three days or six days, until you get up to the height of increase, and then drop back a little and feed that amount as long as she is giving that flow of milk. When she begins to decrease in flow of milk, decrease in proportion. Always watch your record and watch your cow to see how much flesh she has, what her droppings are, etc. A dairyman, in order to be successful, must use his brain and his eyes, and all there is in him. Then you will not fall into the same error and have the same loss that the owners of the cows that make the world's records do; nor the loss that those men have who do not feed at all scientifically or with any system.

Ques. In this association are the cows tested for tuberculosis?

Ans. No, we do not do anything about that, except that the association, if it chooses, can make arrangements with some veterinarian to do their work and can get it done at a discount. That is not necessarily the work of the association.

Ques. Can the services of a tester be divided among two or more associations?

Ans. Yes, although there is no reason why all the dairymen should not belong to the same organization. Our man has a team and drives all the way from Skowhegan to Augusta. But as to whether the services of the tester could be divided among two or more organizations, that of course depends on the number of cows. The tester should have 25 days' work. If it takes two associations to furnish that, it would only be a question of transportation.

SELLING HAY.

ITS RELATION TO CONSERVING FARM FERTILITY.

CHAS. D. WOODS, Director.

Maine Agricultural Experiment Station.

At the conference on agricultural conditions in Maine held at the University in December a year ago, the speaker said, perhaps more dogmatically than he should, that in general it was bad economy to sell hay from a Maine farm. This led to considerable discussion. With the exception of a farmer whose mowing fields are so situated that they are flooded each spring and the washings from his neighbors' farms are deposited upon them so as to increase their fertility, there was no real difference of opinion upon this subject of the selling of hay. Partly because of this discussion the committee in charge of the meeting here has invited the speaker to talk for a few minutes upon the subject of selling hay.

It is said that Dean Swift, once being asked to speak upon the subject of charity, chose for his text: "He that giveth to the poor lendeth to the Lord," and that his sermon comment on the text was: "If you like the security come down with the dust." Inasmuch as it seems to the speaker that the economy in selling hay from a Maine farm can be about as tersely disposed of and, as the committee on program has allotted him an half hour of time, he will go somewhat afield of his subject in the way of introduction and discuss some of the bearings of conservation upon the present crisis in the supply of plant food.

A consideration of the topic of selling hay speedily resolves itself into the larger one of the conservation of the fertilizing resources of the farm, of which the selling of hay is a single phase. Obviously, if all of the products produced upon the farm could be consumed upon the farm and a farmer could produce everything for his own need, agriculture upon that farm would be self-supporting and self-sustaining, and there would be no need of looking outside of the borders of the farm for added plant food. As no farm is self-sustained and self-supporting, nor is it desirable that it should be, the farmer must purchase from the outside for his own need beyond what he can grow. In order to do this it is necessary for him to sell certain products from his land. Obviously, wherever market conditions will warrant he should sell those materials which are produced at the least cost of the resources of the farm and of labor. Fortunately the prices in the world's market are controlled quite largely by the labor cost. Hence it is usual that a man is rewarded by the returns from his produce for any added cost of labor. Unfortunately, however, market conditions do not seem to take into any account the cost of production dependent upon the constituents removed from the farmer's soil. For instance, compare the price of a crop of tomatoes, weighing perhaps ten tons and carrying nitrogen, phosphoric acid and potash worth not more than $7 for the crop, with the money value of a crop of cabbage removing $45 worth of nitrogen, phosphoric acid and potash.

FARM MANURE AS AN AGRICULTURAL RESOURCE.

With the introduction of commercial fertilizers there has been an increasing apparent indifference to farm manure as an agricultural resource. And yet, in mixed farming where animal husbandry enters in as it should, the difference between success and failure may not infrequently be directly traced to the neglect of this farm resource. Too many of our farmers lose sight of the fact that commercial fertilizers should supplement rather than replace the manurial supply of the farm. It is the purpose here to briefly call attention to the value of farm manures in Maine, and particularly to Farmers' Bulletin 192 on Barnyard Manure which is published by the United States Department of Agriculture, a copy of which may be obtained by anyone, by writing to his Congressman.

According to the State Assessor's report for 1913 there were in the State of Maine, in round numbers, 130,000 horses; 250,000 head of neat stock; 40,000 swine; 120,000 sheep and 2,000,000 hens, ducks and geese. If all of the manure was saved from these animals it would amount in a single year to nearly 4,000,000 tons and would carry approximately 19,000 tons of nitrogen, 12,000 tons of phosphoric acid and 18,000 tons of potash. This plant food in the world's market would cost about $10,000,000, or sufficient to buy 300,000 tons of high grade commercial fertilizer. It is doubtful if by present methods of management one-half of this plant food is actually returned to the soil.

The intelligent farmer recognizes that when he sells meat, milk, grain, hay, fruit, vegetables, etc., from his farm or neglects to save and use the manure produced, he removes from his soil a certain amount of potash, phosphoric acid and nitrogen that must be restored sooner or later if production is to be maintained. If the farmer instead of selling off his crops feeds them to live stock on the farm, and if the business of stock feeding is carried to the point where feed is purchased in addition to that grown on the farm, a considerable addition may in this way be made to the fertility of the farm at almost a nominal cost. It is this indirect purchase of fertilizers practiced largely in Europe that to quite a degree accounts for the profits of stock raising abroad. Of course these advantages will not be secured unless the manure produced is carefully saved and used.

Generally speaking, manure produced from working or fattening cattle contains from 90 to 95 per cent of the fertilizing constituents contained in the food. Manure made from cows in milk and from young growing animals contains from 50 to 75 per cent of the fertilizing constituents contained in the food. In the case of animals not increasing in weight and not giving milk the amount of fertilizing constituents in the manure will exactly equal that contained in the food eaten.

It seems to be difficult for the average farmer to really grasp the idea that manure should be as carefully preserved from unnecessary losses as any other product of the farm. The large bulk of the material, the insidious losses, the ease with which commercial fertilizers can be had, the expense of properly providing for storage and application of manure to land, and the lack of proper understanding of the value of the manure and of the large losses that prevail under ordinary farm management, are among the reasons that have led to this neglect.

While it is customary to compare farm manure with fertilizers on the basis of their content of nitrogen, phosphoric acid and potash, this comparison is not adequate for determining the relative value, since manures serve certain purposes fertilizers cannot serve. Farm manure is of a very complex composition. It contains more or less of all of the elements contained in the foods given to the animals and in the litter. It is rich in organic matters, being composed chiefly of vegetable substances. Organic matter is the source of humus to the soil and is of much value. Soils need humus and it can only be supplied by the addition of organic matter in farm manure or by plowing under green crops. Commercial fertilizers do not supply humus.

The urine is by far the most valuable part of the excreta of animals. It is not sufficient to save the solid droppings but the liquid should be collected as well. The amount of fertilizing constituents in a manure stands in direct relation to those in the food. The nitrogen in a food exerts a greater influence on the quality of the manure than any other constituent. It is the most costly fertilizing constituent. It undergoes more change in the animal's stomach than the mineral constituents and rapidly escapes from the manure in fermentation. Even if all the manure is saved and proper absorbents are used, barnyard manure is still an unstable product. It rapidly undergoes changes. The deteriorations of manure result from fermentation and from weathering or leaching. Farm manure loss from destructive fermentation may be largely prevented by the use of proper absorbents and by keeping the manure moist and compact. The loss from leaching may be prevented by storage under cover or in water tight bins.

If practicable, manure should be removed and spread on the field at short intervals and in that case the loss of valuable constituents is not very great. When the manure must be stored for some time the difficulties of preservation are greatly increased. These matters are fully discussed in the Farmers' Bulletin above referred to. Every farmer is urged to get a copy of the United States Department of Agriculture Farmers' Bulletin 192, study it, and put its general principles into practice. If the present shortage of potash should lead the Maine farmer to conserve millions of dollars' worth of plant food which are now being neglected through lack of care in the collection and handling of farm manures it would largely help to offset the losses that may come in 1915 from a potash shortage.

PURCHASED PLANT FOOD.

While there are twenty odd elements that enter into the composition of plants, nitrogen, phosphorus, potassium and calcium are the important ones added in commercial fertilizers. Although an acre of fertile soil contains tons of nitrogen, phosphoric acid and potash, they are usually in forms unavailable to plants. Growing plants take up and carry off in the resulting crops a large amount of available nitrogen, phosphoric acid, potash and lime in a given soil. If the crops are fed upon the farm and the resulting manures are saved, a large part of the manurial matter in a good available form will be returned to the land. If, however, the crops are sold off the farm, the farm is depleted by this loss of plant food which must be made good in some way or other. Usually manures are applied to soil for the double purpose of applying plant food in an available form and unlocking the unavailable compounds which are already in the soil.

New England agriculture has been dependent for the last generation upon the purchase of plant food to supplement that produced upon the farm and replace that sold off in the crops. It has been a matter of great concern to those officially interested in agriculture that New England agriculture is not self-maintaining. That is, it has been necessary to look outside of its borders for the supplies of plant food. Phosphoric acid is found in abundance in this country. Various refuses furnish large amounts of organic nitrogen. Mineral nitrogen in the form of ammonia salts is obtained from coke plants and gas works as a by-product. It is also obtained directly from the air by synthesis. All of the nitrogen in the form of nitrate of soda is, however, imported from South America.

POTASH FOR 1915.

While ordinary farm manures carry some potash, and such materials as sea weed and wood ashes contain potash, the world's usable supply of potash has come from the mines of Germany. The fact that war might make the potash of Germany or the nitrate of soda of South America outside of the reach of the American farmer, has been a matter of great concern for years to the leaders in agricultural thought. This fear is realized in this terrible European war now raging, which prevents the importation from Europe of the German potash salts. There is probably from a quarter to a third as much potash in the United States as would normally be used in the 1915 fertilizers, and hence the question which confronts the fertilizer manufacturer and the user of fertilizers is, how to use this limited supply to the best advantage.

An acre of soil to the depth of one foot in the potato growing districts of Maine carries from four to six tons of potash salts soluble in strong acid. Gradually by soil action this potash is rendered available to growing plants. With the three and four year rotation fairly common in Maine potato districts the crops remove from 225 to 300 pounds of potash per acre. Three hundred bushels (110 barrels) of potatoes will remove about 90 pounds of potash, 50 bushels of oats, about 45 pounds of potash and two crops of two tons of clover and timothy, about 180 pounds. Most of the fertilizer used in these rotations in the potato growing sections is applied for the potato crop. The application will carry from 125 to occasionally 200 pounds of potash per acre. Hence it is evident that in this rotation there is a constant drawing although small upon the reserve stock of potash. In field experiments potash has rarely been a determining element in the yield of the potato crop.

NITRATE OF SODA AND THE POTASH OF THE SOIL.

A field experiment which has been conducted for 20 years at the Agricultural Experiment Station of the Rhode Island State College is probably the most important source of information in this country as to the extent to which soda can replace potash in manures.

The following results selected by Director Hartwell of the Rhode Island Station from those secured in 1914 serve to indicate the value of soda. Different crops were grown upon uniform plots. All were supplied with the needed nitrogen and phosphorus. The potash and soda treatments and the results obtained were as follows:

Fifteen pounds potash per acre, without soda, gave yields of 252 pounds of carrots, 153 pounds of potatoes, and 21 pounds of onions; 15 pounds of potash per acre, with soda, gave 306 pounds of carrots, 183 pounds of potatoes, and 63 pounds of onions; 45 pounds potash, with soda, gave 390 pounds of potatoes, 249 pounds of carrots, and 138 pounds of onions.

Each weight represents the total yield from small triplicate areas. Equal amounts of nitrogen and phosphoric acid were applied in each case. As the crops grew side by side, although not on equal areas, indications are afforded of the relative deficiency of potash and value of soda for the three crops.

From three to four-tenths of the actual increase caused by both the soda and the additional amount of potash is seen to have been caused by the soda. The deficiency of potash was so great, with only 15 pounds of potash, that the addition of soda did not result in normal yields. Had the deficiency been less and a larger amount of soda been added, it is probable that practically normal yields would have been obtained. Two weight parts of soda are chemically equivalent to three parts of potash and the two materials were added in this proportion in the experiment.

Owing to the fact that the manurial treatments had been continued for a number of years, the potash had not only become very deficient in certain plats, but the soda must have exerted, previously, much of its effect.

The experiment has indicated during its course that an application of soda to most of our granite soils would insure the production of normal crops, if potash should be unobtainable in 1915.

One weight part of soda is equivalent to about three parts of nitrate of soda and about two parts of either crude soda ash (sodium carbonate) or common salt. Aside from being a source of soda, the soda ash would reduce the acidity of acid soils; for this purpose it is equivalent to an equal weight of ground limestone.

Director Hartwell states that there is soda enough in the moderate application per acre of 200 pounds of nitrate of soda and 270 pounds of soda ash to be equivalent to 300 pounds of potash; so that, if only a third of it really took the place of potash, it would be temporarily equal to adding 100 pounds of the latter.

In his book "Fertilizers and Manures," Doctor Hall of the Rothamsted (England) Experiment Station says:

"As a manure, nitrate of soda is, of course, treated as a source of nitrogen. It is not sufficiently realized how valuable the soda base may be. This is not because the soda is in any way necessary to the nutrition of the plant, but because of the action of any soluble salt upon the insoluble potash compounds in the soil. The potash in the soil is due to the partial weathering of double silicates like feldspar into clay which is to be regarded as pure kaolinite but as containing a certain proportion of zealitic bodies intermediate between feldspar and kaolinite—hydrated double silicates containing potash, soda, magnesia, and lime combined with alumina and silica. Any soluble salt, and particularly a soluble soda salt, will react with these zeolites and exchange bases to an extent depending upon the relative masses of the two bodies, hence nitrate of soda acts on the clay in the soil, and brings a little potash into solution. To such an extent does this action take place that in practice a dressing of nitrate of soda on any but the lightest soils, will dispense with the necessity of a specific potash manuring even for potash loving crops."

Writing of the effect of nitrate of soda in Rothamsted experiments with mangolds over a series of 25 years, Mr. Hall states:— "The plots receiving potash all give about the same yield whatever the source of nitrogen, but on plots without potash the yield is only maintained on the nitrate of soda plot; on the other two the plant is neither supplied with potash by the manure, nor is the soil forced to yield some of its stored up potash as it is by the nitrate of soda, whereupon the yield declines by one-half or more. For 25 years, then, the use of nitrate of soda alone has enabled the soil to supply a mangold crop with the large amount of potash it wants, though the store of potash in the soil apparently soon becomes exhausted when a manure is used which cannot bring it into solution. With other crops the same results are obtained, though the lack of potash does not become manifest so quickly as in the case of mangolds."

Mr. Hall further quotes the results of a ten-year series of experiments with barley to show that nitrate of soda "has dispensed with the necessity of a potash dressing, which after a time becomes necessary when sulphate of ammonia is the nitrogenous manure."

Again, with respect to a twelve-years' series on mangolds, Mr. Hall writes:—"Here is will be seen that potash increased the crop in every case except where nitrate of soda had been used as the nitrogenous cross dressing, in which case the soda liberates so much potash from the soil that specific application of potassic manures is unnecessary."

FERTILIZER FORMULA FOR 1915.

While the speaker believes it to be important for Maine that as much potash be put in the commercial fertilizers as can be used under the present circumstances, it is more than probable that by more thorough preparation of the soil, the use of liberal quantities of high grade fertilizers carrying equally as much nitrogen as in the past, part of which is present as nitrate of soda, and perhaps rather more phosphoric acid, and with as much potash as can be obtained, there will be no serious shortage in the crops for 1915.

While there are some chemicals, such as lime, gypsum, and chloride, nitrate and sulphate of sodium, which are supposed to be more or less effective in making soil potash available, they can be only slightly depended upon. When potatoes enter into the rotation lime cannot be used because of the danger of scab. Gypsum (land plaster) and sodium chloride (common salt) are about the only chemical agents in addition to nitrate of soda that can economically and safely be used. All commercial fertilizers carry as a by-product in the manufacture of acid phosphate, considerable quantities of gypsum. As land plaster is not an expensive product it probably will be advisable to use it at the rate of perhaps half a ton per acre. It will also be advisable to use a small amount, perhaps 300 pounds per acre, of common salt. Nitrate of soda should enter into the mixed goods as a source of a part of the nitrogen of the fertilizer.

If the present conditions continue it is planned to use both at Highmoor Farm and at Aroostook Farm in 1915 a fertilizer carrying about five per cent of nitrogen, eight to ten per cent of available phosphoric acid, and all the potash that we can obtain up to seven per cent. One-third of the nitrogen will be in the form of nitrate, one-third in the form of ammonia salts and one-third in the form of high grade organic nitrogen. The amount of phosphoric acid will depend upon the amount of potash that can be had. The more potash the less the phosphoric acid. If the potash falls below five per cent we shall apply broadcast about 1000 pounds of land plaster and 300 pounds of common salt per acre. As the land plaster is quite insoluble it must be finely ground. The common salt is readily soluble in water and it can be safely applied in as coarse form as so-called Liverpool salt.

It is to be remembered that this formula is not based upon the results of definite field experiments, nor is it one that the speaker would recommend were sufficient potash available. Although such a formula could not be expected to give results if used year after year the speaker believes that by the use of such a mixture there will be no very material reduction in the yields per acre for a single year. It is self evident that 1915 is not a year in which there should be a reduction in the acreage of hoed crops, particularly upon moderately heavy soils. It may not be advisable to plant light sandy soils in 1915 unless there is a fair amount of farm manure available. Even with a diminished yield the higher prices that it seems likely will prevail will tend to maintain the net profit.

FERTILIZING COST OF DIFFERENT CROPS.

While in general, nitrogen, phosphoric acid, potash, lime and a few other chemical elements, are essential to vegetable growth, the resulting plants contain in varying proportions compounds derived largely from water of the soil and carbon dioxide of the air, which do not contain any of the elements which are essential to plant growth and which are applied in fertilizers. Starch, sugar, woody fiber, and other materials classed as carbo-hydrates, consist entirely of carbon, hydrogen and oxygen. The same is true of the fats and oils, such as the oil of corn and the oil of wheat. While in the production of these materials it is necessary for the vegetable processes to go on that the living cells shall contain more or less of nitrogen, phosphoric acid and potash, the finished product of these classes of foods is free from these constituents, and if one sells starch or sugar, or fats of any kind, it can be done without drawing upon the fertilizing resources of the land.

There are, on the other hand, the highly complex nitrogenous compounds which contain nitrogen, phosphoric acid, potash and other constituents. Therefore, whenever materials containing these highly nitrogenous compounds which are usually grouped under the general name of protein are removed from the land and sold off, valuable fertilizing constituents which are essential to plant growth are taken away from the farm. Obviously, if there were only grown upon and removed from the farm by sale or otherwise, those materials which consist of carbon, hydrogen and oxygen without nitrogen or mineral constituents, theoretically the agriculture would be self-sustaining and the farm could be maintained indefinitely without the addition of any fertilizing materials. As, however, these non-nitrogenous constituents will not of themselves build up animal life it is necessary in the feeding of animals, human and others, to provide these nitrogenous and mineral constituents in the food. While the farms of the land must supply all of the nitrogenous and other food constituents rich in plant food which are essential to sustaining the life of those not living upon the farm, it becomes the problem of the individual farmer not only to produce crops that will meet the public demand at the best possible prices, but at the same time to sell from the farm the least possible of the more valuable fertilizing constituents. Every pound of nitrogen, phosphoric acid, potash and other mineral constituents removed from the land must be replaced or else there will be a diminishing fertility to the soil.

That crops differ widely in the amount of plant food they contain is illustrated by the following:

A ton of apples (about 45 bushels) carries less than three pounds of nitrogen, practically no phosphoric acid and four pounds of potash, the fertilizing value of which is about 70 cents.

A ton of strawberries (a little over 1000 quarts) carries three pounds of nitrogen, two pounds of phosphoric acid and six pounds of potash, the fertilizing value of which is about $1.10.

A ton of potatoes (33 bushels) carries a little more than four pounds of nitrogen, one and one-half pounds of phosphoric acid and ten pounds of potash, with a fertilizing value of about $1.30.

A ton of beets or a ton of rutabagas carries about the same amount and value of plant food as potatoes.

A ton of butter carries about two pounds of nitrogen, no phosphoric acid or potash and has practically no fertilizing value.

It is evident that in selling any of the above from the farm the removed plant food thus disposed of can be readily replaced in purchased plant food. It is to be noted that the value of the plant food contained in these crops is low relatively when the price of the commodity is considered. For instance, a ton of apples is about fifteen barrels. In most years apples are worth at the home station two dollars a barrel. A ton of apples is worth perhaps thirty dollars and the plant food in them seventy cents. In other words, for each dollar received for apples sold it would cost only two cents to replace the plant food thus taken from the farm.

Certain other common products are richer in plant food. This is illustrated by the following:

A ton of oats as grain carries about 40 pounds of nitrogen, 16 pounds of phosphoric acid and 12 pounds of potash, having a fertilizing value of about $9.

A ton of corn kernels carries about 36 pounds of nitrogen, 14 pounds of phosphoric acid, and eight pounds of potash, with a fertilizing value of about $8.

A ton of cottonseed meal carries 133 pounds of nitrogen, 54 pounds of phosphoric acid, and 36 pounds of potash, worth about $30.

A ton of wheat bran carries 55 pounds of nitrogen, 58 pounds of phosphoric acid and 32 pounds of potash, the constituents of which are worth in the fertilizer market about $15.

A ton of milk carries ten pounds of nitrogen, six pounds of phosphoric acid and three and one-half pounds of potash and is worth about $2.50.

A ton of cheese carries about 75 pounds of nitrogen, 15 pounds of phosphoric acid and 16 pounds of potash, the fertilizing value of which is about $16.

The preceding leads one to the few facts and considerations that are, in the speaker's opinion, needed to point out the unwisdom of selling oats, corn, hay and straw from most Maine farms.

A ton of butter worth about $600 contains practically no plant food. A ton of milk worth about $50 contains plant food that will cost $2.50 to buy, and a ton of cheese worth $300 will carry $9 worth of plant food.

A ton of clover hay carries approximately 45 pounds of nitrogen, 12 pounds of phosphoric acid and 32 pounds of potash, worth at prices current in 1914 in mixed fertilizers about $10.75, and sells on the farm for about $10 to $12. Part of the nitrogen, which is the expensive part of the plant food in clover, is derived from the air, however, so that the cost to replace the plant food of clover, as is the case with other legumes, is less than from ordinary grasses.

A ton of oat straw carries about 12 pounds of nitrogen, 4 pounds of phosphoric acid and 25 pounds of potash, worth about $3.50, and sells for $3 to $5 at the barn.

A ton of timothy hay carries about 25 pounds of nitrogen, nine pounds of phosphoric acid and 30 pounds of potash, worth about $6.50. Timothy hay when well grown commands the highest market price and on a Maine farm is worth from $11 to $15 per ton.

A ton of hay from mixed grasses carries about 28 pounds of nitrogen, seven pounds of phosphoric acid and 21 pounds of potash, worth about $7, and sells for $10 to $14 at the barn.

When butter is sold from the farm there is no loss in the fertility of the farm. For each dollar received for cheese sold it will cost only three cents to replace the plant food it carries with it. For each dollar received for milk sold it will cost about five cents to replace the plant food that goes with it. With potatoes at fifty cents a bushel, for each dollar received for potatoes sold it will cost eight cents to replace the plant food sold with them. The above can all be grown and usually marketed without difficulty and with a low percentage of plant food cost as compared with the price obtained.

SELLING HAY EXPENSIVE AND EXHAUSTIVE.

For each dollar received for clover or for straw it will cost approximately another dollar to replace the plant food sold with them. With mixed hay the case is not quite so bad but it will cost from fifty to seventy-five cents to replace the plant food that goes with a dollar's worth of hay.

That this is fact and not theory is illustrated by an experience of twenty years ago at the College farm. There were few agricultural students, the income of the College was small and the demands for students in other lines than agriculture was increasingly large. The farm was not paying. The trustees put the farm in charge of a professor with the instructions to make the farm pay a dividend. This he did for two years by selling hay and carrying no stock of any amount on the farm. At the end of that time the professor died and a year later the farm was turned over to the speaker to be run as part of the experimental work of the Station. It took four years' time and an expenditure for fertilizer larger than the net profit of the two years that hay was sold to get the farm back to the state of fertility as measured by crop production that it had when stock feeding was stopped and hay selling begun. And this on land that had a strong natural grass soil.

Because of the great cost of seeding down land it is usually better to plan at least a five year rotation rather than a shorter term one. Mixed agriculture is far safer and a better proposition for the state as a whole than one crop farming. This is said despite the fact of an apparently very successful one crop farming carried on in the leading agricultural county in the state. Top dressing grass land has always proved profitable when put to the experimental test. The Station top dresses all of its mowing fields each year, using about 100 pounds of nitrate of soda, 200 pounds of acid phosphate, and 100 pounds of muriate of potash per acre. In 1915 the potash will be omitted from the top dressing formula. Such a top dressing will give an increased yield beyond the cost of the fertilizer applied and will make it possible to grow good crops of grass from the land for a number of years without reseeding.

The speaker recognizes that there are special instances in which it may be well to sell hay and purchase plant food. For instance, one may be located near a town where hay can be sold at a good price and stable manure obtained at a nominal cost. Sometimes oats or corn may be exchanged to advantage for more concentrated mill feeds. This may furnish work for teams and men in the winter when otherwise there would be little that could be done. But in general both from the experimental point of view, and from a not inconsiderable experience in farm management, the speaker would sum up his contention and outline his thesis somewhat as follows: (And this is said with an appreciation of the fact that animal husbandry has its serious drawbacks and in and by itself is not always profitable.)

Grass, clover, corn, small grains and their straws are among the most important crops grown upon the farm. It should be the settled policy of the average Maine farmer not to regard these as cash crops. They should be fed upon the farm, and only the finished product be sold. The cash crops should be of a watery nature and those containing the least plant food in proportion to the price they command in the market. Potatoes, sweet corn, roots if there is a market for them, cabbage (although it is a rank feeder and is not profitable unless it can be well sold) are among the best cash crops. The more concentrated crops should be fed and sold in as nearly a finished form, such as meat, milk, cheese, wool or butter, as is possible. Hay in Maine never has and doubtless never will bring a price sufficient in excess of its cost in labor and plant food to warrant, unless in exceptional instances, its sale direct. If, however, one desires to sell hay, both because of its higher market value and its somewhat less plant food, timothy is the grass that should be grown.

When to the value of the plant food carried in hay there is added the cost of preparing the grass, the expense of seed, and the cost of cutting and making hay, it is clear to the speaker, if not to others, that the man who is selling hay is either not getting his money back or else is selling off the plant food in his land. In this latter case he is a "soil robber" as was his father before him and is no wiser than the pioneer who sells the fertility of his soil in wheat and oats, using up in a few years' time the surplus available plant food of the soil that required centuries to accumulate.

Ques. Is it a fact that the Chinese do not use fertilizers?

Ans. They cannot use much because they cannot get it. They have built up a self-sustaining country because the whole country until within a few years has been a closed country. They have not had much sewage. Our great loss is in our sewage systems. The sewage that is taken out to the ocean is taking off our fertilizer. The Chinese have no sewage systems and practically all the excretory matter has been returned to the soil. Some time we are going to get back to that. One thing that has helped Germany is that they have had to put the sewage on the land instead of allowing it to go out to the ocean as they do in Chicago.

Ques. Don't you think we are getting to know more about bacteria and getting more from that?

Ans. We have learned pretty well the theory of bacterial action upon nitrogen, and if we live long enough I shall be greatly surprised if we do not see its action upon phosphoric acid and potash, perhaps within 20 or 25 years. That is going to help us enormously. When I first began to work in the experiment station work we regarded the soil as dead, inert matter and we went right ahead on all our nitrogen problems from the chemical standpoint. But we are learning and today the farmer talks glibly about phosphoric acid, potash and nitrogen; but the thing that is most important in the soil the farmer has not yet grasped,—that the soil is full of living organisms. It is not a dead thing at all, and we are just beginning to put into practice some things the biologists and bacteriologists are finding out relative to nitrogen, etc.

Ques. Do you recommend plowing any deeper on account of the deficiency of potash?

Ans. I would plow every year a half an inch or an inch deeper than the year before until I got down where I could not plow any deeper. Some men talk about plowing six or seven inches deep and they do not own a foot rule or they would find that they were not plowing as deep as that.

Ques. How much can you increase the depth of your plowing each year without injuring the germination?

Ans. That depends largely on your soil, but on general principles I would not go more than one-half an inch deeper than the preceding year.

Ques. What is the limit? Suppose a man has a machine so that he can plow 12 inches deep. Can he ever go too deep?

Ans. I do not think there is any machine that will push down too deep. Subsoil plowing has always paid. Of course it is no use to plow 12 inches deep and use a crop that does not feed more than three inches deep, but for certain crops 12 inches is not too deep.

Ques. Did you ever think of the possibilities of selling timothy hay in this state and buying alfalfa?

Ans. I should rather grow something than buy alfalfa. Of course we have got to grow hay in our rotations and it may be that it is going to be advisable for a man in some circumstances to sell timothy hay and buy in concentrates in the form of alfalfa. When we can grow clover as magnificently as we can in Maine, I would not think much about alfalfa. That is a very valuable crop where it can be grown, but our trouble here is our winters. I do not know as we shall ever find out how to prevent alfalfa from being ice bound by our melting snows. It will stand our climate, and it will run along two or three years pretty well and then we get a winter when the snow melts in the spring and then it freezes and we get an ice blanket. I would rather grow clover and fine grasses than pay for the removal of timothy hay from the farm and the transportation of alfalfa. There is a large transportation loss which we do not take into account.

Ques. Have you had any experience in the protection of alfalfa? Is there any protection that can be furnished artificially?

Ans. We have experimented with that only slightly. We carried alfalfa in Aroostook county quite a little while because there we have a snow blanket and we usually don't get the ice conditions. The only protection we tried was to keep the last cutting and let it serve as a mulch. It went along nicely for three years and then we got a winter which destroyed every plant. When we were experimenting with alfalfa I found out that when they wanted to plow alfalfa in the irrigated districts in Ohio they flooded it and let the ice form and that killed it and then they could plow it out. Those are the conditions we get in Maine by the act of God instead of the act of man. There is another thing that we want to remember. Of course for the dairyman alfalfa is a great crop, but if we want to put in potatoes for a cash crop, in a three, four or five years' rotation alfalfa has no place.

Mr. Adams: We farmers sometimes run an experiment station of our own. I had lots of fun in trying to raise alfalfa for quite a long series of years. I sent west and got the soil and sent and got the commercial inoculation. I am satisfied to stop now and let somebody else try it.

Dr. Woods: I would like to have every farmer keep playing with alfalfa and then sometime somebody may discover here in Maine a method by which we can handle alfalfa profitably, and when we can it will undoubtedly be valuable. But the farmer should not attempt to grow one, two or three acres; only the agriculturist can do that, who earns his money in the city and spends it on the farm.

Ques. In your experience with alfalfa, have you been able to make any headway without using bacteria?

Ans. You can grow it, but you cannot grow it to advantage.

Ques. Can you continue it for any length of time? Isn't it more apt to die after two or three years?

Ans. We have not had much experience in that line as we can get almost no seed but will have some of the bacteria, or soil which has not been inoculated. For instance, down in Princeton we did not do any inoculation but the root nodules began to develop.

Ques. You have not continued to grow it in that place?

Ans. No; there are so many other things that are so much more important for us to do that we have not done anything with alfalfa for ten years.

Mr. Holston: One crop has not been mentioned and that is sweet clover. Has anybody had any experience with that? We are reading a good deal in the dairy papers about sweet clover.

Dr. Woods: If sweet clover is allowed to get a foothold in good shape it might be one of the fibre crops. It has to be cut pretty young for feed. If you let sweet clover grow up, as I have seen it, so that it is nearly as tall as I am, it would make pretty good paper.

Ques. I would like to ask Mr. Holston if he has raised sweet clover?

Mr. Holston: I have raised it for a fibre crop but I have never fed it. In raising other fibre crops I had trouble in getting rid of it. I have sold some to dairy farmers and they like it very much when cut early. You have to cut it by the middle of June. You may get another crop in six or eight weeks and you may be able to get a third crop.

Ques. Did you use any inoculation for your sweet clover?

Ans. Not at all; it does not need it. The best stand I ever had was on an ash heap where ashes had been dumped.

Ques. It is being told to us through the press and in different ways that sweet clover not inoculated will grow and thrive and in growing the sweet clover the soil is inoculated for alfalfa. Is that your experience?

Ans. I have grown alfalfa on soil that had been inoculated with sweet clover, and as far as I know it is still alive. That was done five years ago.

Ques. Did you have a comparison where sweet clover had not been grown?

Ans. Not on the same plot.

Ques. Did you examine the alfalfa to see if those nodules were on the roots?

Ans. I exhibited the nodules on the roots from that piece of alfalfa.

Ques. Did you lime the piece to start with?

Ans. The alfalfa piece was limed. I got it in as good a condition as I could.

Ques. Have you been able to make fibre crops pay financially?

Ans. I have not, because we can buy wood cheaper than we can raise those crops. The price has got to advance considerably beyond what it is now in order for the use of fibre crops in place of wood to be profitable.

Dr. Woods: There is a very interesting amount of data which came from the experiments made by Mr. Holston under the direction of the superintendent of the mill in which they were trying to find a fibre crop to do away with the railroad haul. The railroad haul today is half the cost of the pulp stock of that particular mill. They were trying to find a .fibre crop that could be grown in sufficient amounts within hauling distance and at renumerative prices. I wish there was some way for those facts to be published.

Ques. Have you ever tried hemp, Mr. Holston?

Ans. Yes, sir; I have raised probably as good a hemp as could be raised anywhere in the country, even in Kentucky where they raise the best hemp in the world.

Ques. What crop came the nearest to what you wanted?

Ans. Hemp.

Ques. Then you can raise hemp in Maine?

Ans. Yes, sir. You can plant it as early as you can oats and cut it as late as you want to.

Ques. How many times as much as wood pulp would it cost?

Ans. Nearly three and one-half times wood pulp.

Ques. In other words, if you could raise three and one-half times as much per acre you might raise it profitably?

Ans. I have raised as high as 8100 pounds of hemp per acre.

MILKING MACHINES.

By P. R. Zeigler, Boston, Mass.

In talking of milking machines I am not here in the same way as a professor of agriculture. I am interested in the sale of a certain milking machine, and in what I have to say you are at liberty to make such deductions as you see fit, although it will be my intention to keep my statements confined to actual facts.

As far as milking machines in general are concerned, they have been on the market about ten years, and in that length of time they have increased from one machine to eight or ten. The situation is very much like this: When the first milking machine came out it was impossible to supply the demand for it. The dairymen thought that this was the solution of their dairy problems and they put in their orders and kept writing the company, asking why they did not ship the machines. The company was not prepared for the sudden demand, and a great many of the machines that were shipped were failures and were taken out. The milking machine as it was first put out called for more thought and greater attention on the part of the operator and it did not get the attention it required to be successful. As the result of that experience, there was no demand for a time. Then it was discovered that there were a number of people who continued to use milking machines, and so they came back into consideration again, and today we have on the market eight or ten different makes, and of course they are all more or less successful. The difference between the machines is just the same as the difference between other pieces of machinery. It is more a question of the amount of care required to operate them, their simplicity or their complexity in methods of operation.

Just a few words in regard to the need of milking machines A man came to me a little while ago and said, "There are so many men out of employment that I presume it affects the milking machine business." When the machines first came in, scarcity of help was a factor in creating a demand, but today the price of cows has risen a great deal in Brighton market, so that cows are worth twice what they were seven years ago, and the result of that has been that the dairymen have felt it is not a question of getting any person to milk, but of getting a competent person. In other words, it is not a question of getting any kind of labor, but particular kinds of labor. We still have trouble in getting sufficient hand labor to take care of cows, but I think a still greater difficulty has been to get the quality of men that we desire for hand milkers. Any dairyman who has had any experience with cows knows the difference between the record of a cow in a good milker's hands and in a poor milker's hands. And so if milking machines would milk cows successfully, if there was no other advantage they would be preferable to hand milking because one man can milk about three times as many cows with a machine as he can by hand.

And then there is this other feature—that the milking machine in the hands of a good man will discount unfavorable conditions. It has been shown, in isolated cases, that remarkably fine milk can be produced in very poor quarters. A year ago, in the competition for milk at the meeting of the Massachusetts Dairy Association, the man who got $200 in cash prizes for clean milk was a man whose equipment was deplorable. He went against every tenet of good dairying. His barn was a picture of "How not to do it." And yet by extreme care he was able to produce good milk. And so I say that the milking machines sometimes discount unfavorable conditions, in the hands of a good man, if they are kept clean. The milk passes directly from the cow and the outside conditions are less effective.

The next question is, What will milking machines do? Upon that question there is a very wide difference of opinion. If you should look at the circular advertising the first milking machine that was put out, ten years ago, you would find that it said that one man could milk 35 cows an hour, and it named a man who had been successful with 45. That was not with any desire to distort the situation. It was the belief that this could be done. Now we have come down to what we think can be done under average conditions. I should say that an average man could milk 22 to 28 cows, depending on the breed and the amount of milk they gave. I find that many make the mistake of thinking that milking the cows is simply putting the machine on and taking it off.

The second point in the advantage is the fact that it does not injure the cow. Frequently the question is asked, Does the machine draw blood? Any milking machine made today will not draw blood, as far as the best of my knowledge and belief goes. You can leave it on the teat as long as you want to and you would never draw blood provided the cow's teat was well in the first place,—assuming a normal cow. That does not mean that it is desirable to leave the machine on after the milk is drawn. The only way it would injure the cow would be the same as if a man sat down to milk by hand and kept fussing with the cow. Pretty soon the cow would be holding up her milk. But so far as doing anything that a veterinarian would discover was not right, the machine would not do this.

Another point is the matter of clean milk. I attended last June the annual meeting of the Certified Milk Producers Association of America held in Boston. The secretary of the association gave a talk about producing certified milk with milking machines. He gave the record of one certified milk farm that had taken 182 bacterial counts of the milk between Oct. 5 and June 1. The samples were not taken at the farm. The milk was shipped to New York and bottled and distributed with teams in Brooklyn and the samples were taken from the bottles in Brooklyn; and the average of the 182 counts was 2900 bacteria. In no case was there over 10,000. I presume that is responsible more than anything else for the fact that there are a number of certified milk farms using our machines. The Borden's Condensed Milk Company on their own certified milk farm are using milking machines, and that is true of the Sheffield Farm.

The fourth advantage is the independence one gets. I do not suppose there is a man here, if he runs his own farm and has to do it with hired labor, but has at one time or another been extremely tried if he has told a man for a number of times to do something in a certain way and he has not done it. When you recall that back there in the barn you have 20 or 30 or 40 cows to milk, and wonder what would happen if you did speak out and the man threw up his job you hesitate and keep on with that sort of help because you cannot do otherwise. But with the milking machine you are absolutely independent. If you want to keep at it long enough, you can milk 100 cows alone.

The fifth thing is lower cost. We have just had it pointed out to us here that the way for a farmer to realize on his farm is to sell his product in the most concentrated form and keep animals to keep up the fertility rather than to sell off the hay. The farmer says, "I know this, but when I get more cows my trouble begins." It is an expensive job to milk those cows. It lasts seven days in the week. With the machine your trouble is minimized. You are independent and can lower your cost of milk production. You do not have to tie up all your profits in extra wages for a man, especially when he cannot be useful in other ways, at some times of year.

We come finally to the question in everybody's mind, Are milking machines really successful? If there was some way in which I could convince every person here that milking machines were successful, either I or somebody else representing some other make of machine would get an order from every dairyman who is able to finance it. But there is lurking in your mind this question. The reason it is bothering you is that while some men have milking machines and think very well of them, another man has one and it is not successful in his hands. What is the trouble? All I can say is, the milking machines are the same at every man's place and the cows are the same, so far as this matter is concerned, and the difference is in the man. It has been said that "Milking machines are just about as successful as the man who runs them." The personal element in the machine is a large one. Unless you are prepared to handle it right you had better not have one. I do not mean that it takes the dexterity and skill that it does to play the piano, but there are a few things to be done and if those are not done there is not a machine on the market that will be successful.

I said a few moments ago that milking machines were always successful in some men's hands but they have not been in all men's hands. We have been making changes which will better fit them for the ordinary help. The first three elements to consider are the pumps, the pipe line and the milker. The pump is used to create a vacuum. That is one thing that is absolutely essential. You must have a reliable, steady, constant vacuum. When we started with the machines people asked us if they could not, to save expense, create a vacuum by an injector, a device through which steam passed. As it passes through the pipe line it draws the air through and creates a vacuum. That can be done and we can milk successfully, but the most of the boilers that produced the steam in those early days were fired by wood. That would make a hot fire and a sufficient vacuum and then the fire would cool off and the vacuum would fall, and the result was unsatisfactory. We had a pump which was a crude affair. The pistons were packed with leather, and pretty soon the pump was not as effective; we did not have enough vacuum. We have remedied all those difficulties by making ourselves a vacuum pump, working on the same principle as a gasolene engine.

Now our pipe line was the second question. When we first put out the pipe we used black pipe which rusts easily. There is more or less moisture in the pipe line on account of the pipe being cold and the air warm so that the moisture in the air is precipitated, and the pipe rusted, which tended to block up the opening, and pretty soon we did not have passage enough. Now we use nothing but galvanized iron.

The third point is the machine itself. In the machine we have, the principal thing after all is the teat cup. In milking a cow, if you use suction—and all of the machines on the market that might be said to be practical are suction machines—you must have absolute relief on the cow's teats. If you have a steady suction she will not give down her milk. We found that if the little hole through which the relief was afforded became stopped up, there was trouble. This difficulty was eliminated. When the automobiles were first manufactured, we would find a man under his machine very often. Nowadays they go right along. It is the same way with milking machines. These things have been ironed out.

I will now put on the screen some pictures showing different types of milking machines.

STATISTICS OF AGRICULTURAL SOCIETIES.

OFFICERS OF AGRICULTURAL SOCIETIES.

Name of Society.	President.	P. O. Address.	Secretary.	P. O. Address.	Treasurer.	P. O. Address.
Maine State Agricultural	B. J. Libby	Oakland	J. L. Lowell	Auburn	T. F. Callahan	Lewiston.
Eastern Maine Fair Association	A. S Field	60 Court Street, Bangor.	Mrs. S. P. Emery	24 Forest Avenue, Bangor.	Albert S. Field	60 Court Street, Bangor.
Central Maine Fair Company	S. E. Whitcomb	Waterville	R M. Gilmore	Waterville	L. G. Whipple	Waterville.
Maine State Pomological	W. H. Conant	Buckfield	E. L. White	Bowdoinham	T. E. Chase	Buckfield.
Androscoggin, Greene Town Fair Association	L. C. Mendall	Greene	W. L. Mower	Greene	B. P. Rackley	Greene.
Aroostook, Northern Maine Fair Association	J. Frank Guiou	Presque Isle	Ernest T. McGlauflin	Presque Isle	John E. Bishop	Presque Isle.
Aroostook, Houlton	Nathaniel Tompkins	Houlton	F. N. Vose	Houlton	Aaron Putnam	Houlton.
Cumberland County	Chas. W. Chaplin	Gorham	H. William Smith	Gorham	Harry C. Palmer	Gorham.
Cumberland Farmers' Club	A.W. Stanley	Cumberland Ctr., R. F. D.	Willard Wilson	Cumberland Ctr., R. F. D.	Willard Wilson	Cumberland Ctr., R. F. D.
Cumberland, New Gloucester and Danville	F. H. Gray	New Gloucester	J. P. Witham	New Gloucester	G. C. Jordan	New Gloucester.
Cumberland, Freeport Poultry Association	A. Q. Carter	Freeport	George P. Coffin	Freeport	Louis E. Curtis	Freeport.
Cumberland, Little Rigby Park	Sumner O. Hancock	Casco	Ernest U. Archibald	West Poland	Leland H. Poore	Webb's Mills.
Franklin County	Frank N. Blanchard	Farmington, R. F. D. 5.	George D. Clark	Farmington	Charles H. Pierce	Farmington.
Franklin, North	E. Hill	Phillips	J. I. Harnden	Phillips	A. E. Bunnell	Phillips.
Hancock County	Frank P. Merrill	Bluehill	Gilbert F. Candage	Bluehill Falls	Max R. Hinckley	Bluehill.
Hancock, Eden	Charles L. Shand	Bar Harbor	Julien Emery	Salisbury Cove	Charles F. King	Eden.
Hancock, North Ellsworth	John McNamara	Ellsworth, R. F. D. 3.	H. Fremont Maddocks.	Ellsworth, R. F. D. 3.	Asa C. Flood	Ellsworth Falls.
Kennebec, South	L. B. Hisler	Windsorville	Arthur N. Douglas	Gardiner, R.F.D.9	Jasper S. Gray	Windsorville.
Knox, North	E. E. Thurston	Union	H. C. Grinnell	Union	George C. Hawes	Union.
Lincoln County	Leslie Boynton	Jefferson	J. A. Perkins	Nobleboro	H. E. Winslow	Damariscotta.
Lincoln, Bristol	E. P. Richards	Round Pond	J. Wilbur Hunter	Damariscotta	C. B. Woodward	Damariscotta.
Oxford County	W. J. Wheeler	South Paris	W. O. Frothingham	South Paris	W. O. Frothingham	South Paris.
Oxford, West	E. C. Buzzell	Fryeburg	B. Walker McKeen.	Fryeburg	Alvin D. Merrill	Fryeburg.
Oxford, Androscoggin Valley	J. M. Johnson	Lewiston	O. M. Richardson	Canton	G. L. Wadlin	Canton.
Oxford, North	Charles T. Poor	Andover	John F. Talbot	Andover	R. A. Grover	Andover.

Oxford, Western Maine Poultry Association	A. E. Shurtleff	South Paris	E. P. Crockett	South Paris	D. H. Bean	South Paris.
Penobscot, West	E. M. Atkins	Dexter, R. F. D. 3	E. E. Colbath	Dexter, R. F. D. 3	F. C. Barker	Exeter.
Penobscot, North	H. B. Lewis	Springfield	I. R Averill	Prentiss	O. A. McKinney	Springfield.
Penobscot, Orrington	Chas. H. Chapman	South Brewer, R. F. D. 1.	F. Elmer King	South Brewer, R. F. D. 1.	F. Elmer King	South Brewer, R. F.D. 1.
Penobscot, Bangor Poultry Ass'n	J. P. Webster	Bangor, Webster Avenue.	Cyrus S. Winch	Bangor, 77 Park Avenue.	Cyrus S. Winch	Bangor, 77 Park Avenue.
Piscataquis County	C. W. Hayes	Foxcroft	J. A. Wiles	Foxcroft	A. J. McNaughton	Foxcroft.
Sagadahoc County	Daniel Brown	Gardiner, R. F. D. 13.	E. C. Patten	Topsham	Isaiah Morrell	Brunswick.
Sagadahoc, Richmond Farmers' and Mechanics' Club	Henry F. Smith	Richmond	N. H. Skelton	Richmond	W. Fairclough	Richmond.
Somerset County	B. F. Burns	Madison	J. F. Withee	Madison	J. F. Withee	Madison.
Somerset, East	A. W. Miller	Hartland	H. H. Caston	Pittsfield	D. A. Packard	Hartland.
Somerset, Central	C. W. Day	Skowhegan	S. H Bradbury	Skowhegan	J. W. Fogler	Skowhegan
Somerset, Embden	Grant Witham	Solon	Chester K. Williams	North Anson	D. S. Witham	Solon.
Waldo, Belfast Fair Association	Walter J. Clifford	Belfast, Northport Avenue.	Orrin J. Dickey	Belfast, 34 Church Street.	Orrin J. Dickey	Belfast, 34Church Street.
Waldo and Penobscot	F. A. Littlefield	Monroe	F. H. Putnam	Monroe	C. M. Moore	Monroe.
Waldo, Unity Park Association	J. H. Campbell	Plymouth	E. T. Reynolds	Unity	E. T. Reynolds	Unity.
Washington County	F. W. Pomroy	Pembroke	J. M. Morgan	West Pembroke	J. C. McFaul	Pembroke.
Washington, West	A. H. Chandler	Columbia Falls	Wm. N. Dyer	Harrington	E. V. Coffin	Harrington.
Washington, Machias Valley	W. G. Means	Machias	S. N. Tobey	Machias	G. B. Boynton	Machias.
Washington, Calais Fair Ass'n	W. L. Eaton	Calais	Thos. J. Doyle	Calais	George Downes	Calais.
York, Shapleigh and Acton	Clarence A. Butler	Emery Mills	Fred K. Bodwell	Acton	Geo. T Crediford	Shapleigh.
York, Cornish Agricultural Ass'n	O. W. Adams	Cornish	Wm. R. Copp	Cornish	S. G. Sawyer	Cornish.
York, Berwick Poultry Ass'n	Herbert Sharp	Berwick	Arthur C. Brooks	Berwick	Arthur C. Brooks	Berwick.
York, Grangers' Fair Ass'n	John M. Deering	Saco	Wm. W. McIntire	Saco	Alphonso E. Libby	Saco.
York County Poultry Ass'n	Robert Rankin	Sanford	F. E. Young	Springvale	Jesse H. Tarbox	Sanford.

ANALYSIS OF EXHIBITIONS.

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 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).
Maine State Agricultural	110	48	273	27	140	32	60	522	220	102	950
Eastern Maine Fair Association	61	20	55	-	-	-	75	136	83	24	315
Central Maine Fair Company	201	77	156	9	225	42	175	349	155	96	320
Maine State Pomological	-	-	-	-	-	-	-	-	-	-	-
Androscoggin, Greene Town Fair Association	5	9	36	10	10	-	18	70	-	-	3
Aroostook, Northern Maine Fair Association	137	74	173	25	8	-	140	280	115	44	447
Aroostook, Houlton	56	79	178	22	-	72	220	571	91	26	250
Cumberland County	135	24	61	47	80	18	30	260	37	30	203
Cumberland Farmers' Club	12	2	11	12	30	10	4	69	5	1	148
Cumberland, New Gloucester and Danville	40	3	14	15	-	-	-	32	-	-	-
Cumberland, Freeport Poultry Association	-	-	-	-	-	-	-	-	-	-	520
Cumberland, Little Rigby Park	14	-	-	5	18	4	-	27	-	-	2
Franklin County	110	49	163	108	250	142	108	712	134	12	200
Franklin, North	75	10	15	124	180	18	54	337	70	30	10
Hancock County	33	3	-	18	42	2	26	91	7	-	19
Hancock, Eden	7	3	-	9	-	-	-	12	4	6	22
Hancock, North Ellsworth	-	3	9	-	2	-	-	14	-	-	2
Kennebec, South	23	8	8	17	112	10	30	155	8	-	2
Knox, North	35	6	20	26	106	8	18	184	15	6	22
Lincoln County	46	5	10	24	92	7	20	153	-	-	12
Lincoln, Bristol	14	2	1	10	38	-	-	51	-	6	23
Oxford County	181	53	127	90	260	10	97	637	74	23	159
Oxford, West	73	13	72	75	210	25	56	451	27	18	44
Oxford, Androscoggin Valley	81	30	78	38	88	9	60	303	8	20	28
Oxford, North	21	5	21	15	18	6	24	65	32	24	19

Oxford, Western Maine Poultry Association	-	-	-	-	-	-	-	-	-	-	595
Penobscot, West	63	15	57	48	20	-	45	185	60	37	108
Penobscot, North	6	4	24	5	-	-	-	33	-	-	-
Penobscot, Orrington	6	1	-	8	2	-	4	15	7	2	11
Penobscot, Bangor Poultry Association	-	-	-	-	-	-	-	-	-	-	35
Piscataquis County	34	9	26	28	6	-	42	111	11	5	5
Sagadahoc County	57	21	291	44	54	20	120	430	113	37	250
Sagadahoc, Richmond Farmers' and Mechanics' Club	10	2	11	14	12	-	-	39	-	2	4
Somerset County	51	11	23	65	66	24	14	203	52	2	40
Somerset, East	46	1	1	24	8	-	-	34	26	6	78
Somerset, Central	48	18	55	41	22	10	-	146	45	36	200
Somerset, Embden	34	5	22	6	-	4	30	67	13	20	2
Waldo, Belfast Fair Association	10	2	-	1	2	-	-	5	-	-	310
Waldo and Penobscot	31	13	35	31	42	8	38	198	7	2	19
Waldo, Unity Park Association	95	22	76	61	39	25	90	198	19	9	34
Washington County	16	2	13	26	6	-	18	47	14	11	21
Washington, West	19	18	27	39	32	-	-	116	38	21	34
Washington, Machias Valley	7	3	4	11	16	-	-	34	12	5	59
Washington, Calais Fair Association	12	5	8	40	2	-	10	55	8	10	420
York, Shapleigh and Acton	2	-	-	-	54	16	-	70	1	-	14
York, Cornish Agricultural Association	10	16	50	29	104	10	6	215	-	12	59
York, Berwick Poultry Association	-	-	-	-	-	-	-	-	-	-	323
York, Grangers' Fair Association	14	2	15	6	44	4	4	75	-	2	61
York County Poultry Association	-	-	-	-	-	-	-	-	-	-	201
	2,041	696	2,219	1,253	2,440	536	1,636	7,791	1,511	687	6,603

ANALYSIS OF AWARDS.

Name of Society.	Amount of premiums awarded trotting bred stallions.	Amount of premiums awarded trotting bred brood mares.	Amount of premiums awarded draft stock stallions.	Amount of premiums awarded draft stock brood mares.	Amount of premiums awarded family horses.	Amount of premiums awarded gentlemen's drivers	Amount of premiums awarded matched carriage horses.	Amount of premiums awarded colts.	Amount of premiums awarded horses for draft.
Maine State Agricultural	$75 00	$25 00	$85 00	$18 00	-	$34 00	$30 00	$120 00	$135 00
Eastern Maine Fair Association	71 00	12 00	35 00	12 00	$17 00	21 00	28 00	39 00	22 00
Central Maine Fair Company	52 00	27 50	155 00	42 00	-	15 00	-	-	200 00
Maine State Pomological	-	-	-	-	-	-	-	-	-
Androscoggin, Greene Town Fair Association	-	-	-	-	-	-	-	3 50	23 00
Aroostook, Northern Maine Fair Association	37 00	25 00	165 00	115 00	44 00	26 00	-	325 00	90 00
Aroostook, Houlton	60 00	15 00	200 00	100 00	50 00	5 00	-	200 00	87 00
Cumberland County	45 50	19 00	27 00	15 00	-	30 00	15 00	12 00	63 00
Cumberland Farmers' Club	2 00	2 00	-	2 00	-	-	-	3 00	23 00
Cumberland, New Gloucester and Danville	4 00	5 00	4 00	3 00	-	5 00	-	15 50	25 00
Cumberland, Freeport Poultry Association	-	-	-	-	-	-	-	-	-
Cumberland Little Rigby Park	-	3 00	-	3 00	-	-	-	-	16 00
Franklin County	13 00	9 00	19 00	9 00	16 00	34 00	19 00	20 00	54 00
Franklin, North	2 00	6 75	1 00	4 50	-	6 00	-	13 35	20 00
Hancock County	8 00	4 00	5 00	5 00	-	2 00	2 00	28 00	18 00
Hancock, Eden	-	-	-	-	-	-	-	11 00	-
Hancock, North Ellsworth	-	-	-	-	-	-	-	-	-
Kennebec South	-	-	3 75	3 00	-	-	-	19 00	9 00
Knox, North	2 00	-	3 50	3 00	3 00	2 50	-	25 25	51 00
Lincoln County	6 00	3 00	2 00	3 00	3 00	10 00	-	19 00	15 00
Lincoln, Bristol	-	-	-	3 00	-	-	-	-	-
Oxford County	23 00	27 00	6 00	12 00	68 00	41 00	-	71 00	175 00
Oxford, West	28 00	13 00	46 00	10 00	-	-	17 00	-	47 00
Oxford Androscoggin Valley	22 00	10 00	8 00	10 00	-	10 00	10 00	23 00	80 00
Oxford, North	3 00	3 75	5 75	3 75	-	-	5 00	5 00	24 00

Oxford, Western Maine Poultry Association	–	–	–	–	–	–	–	–	–
Penobscot, West	5 00	4 00	9 00	12 00	–	10 00	5 00	35 50	107 00
Penobscot, North	–	1 50	–	–	–	–	–	6 50	–
Penobscot, Orrington	–	–	–	–	–	4 50	–	–	5 00
Penobscot, Bangor Poultry Association	–	–	–	–	–	–	–	–	–
Piscataquis County	5 00	5 00	8 00	6 00	5 00	10 00	6 00	10 00	50 00
Sagadahoc County	34 00	10 00	30 00	10 00	8 00	–	–	24 00	90 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	1 00	–	1 00	–	1 00	–	–	2 85	9 00
Somerset County	8 00	10 00	10 00	6 00	6 00	10 00	3 00	22 50	40 00
Somerset, East	22 00	14 00	15 00	12 00	–	14 00	5 00	28 00	160 00
Somerset, Central	7 00	4 00	2 00	15 00	–	20 00	12 00	22 50	88 00
Somerset, Embden	–	–	3 00	–	–	2 00	–	18 00	20 00
Waldo, Belfast Fair Association	–	3 00	4 00	8 00	6 00	–	–	–	–
Waldo and Penobscot	12 00	5 00	11 00	9 00	10 00	12 00	14 00	23 00	98 00
Waldo, Unity Park Association	16 50	6 00	20 00	6 00	12 00	8 00	16 00	27 50	30 00
Washington County	3 00	7 00	3 00	9 00	–	–	–	18 50	4 00
Washington, West	–	–	–	–	–	100 00	–	23 00	91 00
Washington, Machias Valley	–	–	20 00	–	–	18 00	–	9 00	3 00
Washington, Calais Fair Association	8 00	–	8 00	–	–	6 00	–	22 00	–
York, Shapleigh and Acton	–	–	–	–	2 00	2 00	–	–	–
York, Cornish Agricultural Association	–	4 00	–	–	2 00	4 00	4 00	24 00	–
York, Berwick Poultry Association	–	–	–	–	–	–	–	–	–
York, Grangers' Fair Association	–	–	–	–	–	–	–	8 00	56 00
York County Poultry Association	–	–	–	–	–	–	–	–	–
	$575 00	$283 50	$915 00	$469 25	$253 00	$462 00	$191 00	$1,277 45	$2,028 00

ANALYSIS OF AWARDS—Continued.

NAME OF SOCIETY.	Amount of premiums awarded thoroughbred bulls and bull calves.	Amount of premiums awarded thoroughbred cows, heifers and heifer calves.	Amount of premiums awarded grade cows, heifers and heifer calves.	Amount of premiums awarded herds.	Amount of premiums awarded working oxen and steers.	Amount of premiums awarded matched oxen and steers.	Amount of premiums awarded trained steers.	Amount of premiums awarded beef cattle.	Amount of premiums awarded town teams.	Amount of premiums awarded oxen and steers for draft.
Maine State Agricultural	$380 00	$585 00	$284 50	$296 00	$32 00	$58 00	$30 00	$68 00	$180 00	$330 00
Eastern Maine Fair Association	111 00	337 00	-	95 00	-	-	-	-	-	-
Central Maine Fair Company	210 00	452 50	17 50	225 00	87 00	110 00	-	125 00	97 50	215 00
Maine State Pomological	-	-	-	-	-	-	-	-	-	-
Androscoggin, Greene Town Fair Association	3 50	8 50	6 00	-	2 50	1 00	-	-	-	-
Aroostook, Northern Maine Fair Association	510 00	903 00	120 00	188 00	17 00	-	11 00	-	-	15 00
Aroostook, Houlton	375 00	450 00	80 00	224 00	-	-	-	50 00	-	-
Cumberland County	160 00	180 00	33 00	32 00	171 00	77 00	55 00	22 00	32 00	150 00
Cumberland Farmers' Club	4 00	16 00	20 00	5 00	9 00	13 00	-	13 00	22 50	43 00
Cumberland, New Gloucester and Danville	7 00	22 00	15 00	-	8 00	2 00	-	-	-	-
Cumberland, Freeport Poultry Association	-	-	-	-	-	-	-	-	-	-
Cumberland, Little Rigby Park	-	-	13 00	-	-	6 00	-	6 00	8 00	8 00
Franklin County	116 00	200 00	91 00	72 00	39 00	57 00	11 00	37 50	174 00	107 00
Franklin, North	9 45	10 05	27 90	30 00	6 00	10 40	2 50	8 00	40 00	30 00
Hancock County	15 00	-	34 00	10 00	16 00	7 50	-	5 00	10 00	20 00
Hancock, Eden	5 00	11 75	-	-	-	-	-	-	-	-
Hancock, North Ellsworth	12 50	16 50	-	-	-	1 00	-	-	-	-
Kennebec, South	26 50	13 25	19 75	13 00	20 75	53 25	12 00	14 00	54 00	128 75
Knox, North	17 00	27 25	32 75	17 00	25 00	17 00	5 00	6 00	45 00	54 00
Lincoln County	13 50	17 75	20 45	16 00	7 50	11 00	1 00	8 00	35 00	95 00
Lincoln, Bristol	10 00	3 00	6 75	-	8 00	4 50	-	-	10 00	1 50
Oxford County	224 00	215 00	201 00	103 00	151 00	72 00	-	32 00	127 91	301 00
Oxford, West	67 00	168 70	168 70	96 00	56 00	63 00	-	28 00	156 00	150 00
Oxford, Androscoggin Valley	54 00	85 00	60 00	45 00	30 00	44 00	5 00	9 00	52 00	56 00
Oxford, North	18 00	44 50	25 00	18 00	12 00	9 00	-	6 50	5 00	-
Oxford, Western Maine Poultry Association	-	-	-	-	-	-	-	-	-	-

Penobscot, West	38 00	142 50	62 25	44 00	24 00	9 00	–	–	–	–
Penobscot, North	5 50	25 00	5 00	5 00	–	–	–	–	–	–
Penobscot, Orrington	3 00	–	6 25	4 00	2 00	–	–	–	–	–
Penobscot, Bangor Poultry Association	–	–	–	–	–	–	–	–	–	–
Piscataquis County	21 50	37 25	31 25	36 00	3 50	2 00	–	–	–	–
Sagadahoc County	236 00	970 00	234 00	190 00	30 00	30 00	4 00	101 00	84 00	227 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	1 05	6 20	4 05	2 00	3 50	–	–	–	–	–
Somerset County	12 50	23 75	60 50	10 00	28 00	26 50	4 00	27 50	46 00	58 00
Somerset East	3 00	2 00	34 00	–	17 00	–	–	–	–	–
Somerset, Central	55 00	118 00	83 00	–	17 00	16 00	–	23 00	28 00	84 00
Somerset, Embden	11 00	14 00	2 00	13 00	–	–	–	–	–	–
Waldo, Belfast Fair Association	8 00	2 00	–	–	–	–	5 00	–	–	–
Waldo and Penobscot	33 00	144 00	42 50	110 00	10 00	33 00	9 00	27 00	25 00	90 00
Waldo, Unity Park Association	37 50	55 75	37 75	77 00	16 00	37 50	5 50	22 75	12 00	20 00
Washington County	6 00	17 00	23 00	14 00	21 00	–	–	–	–	–
Washington, West	69 00	103 00	94 00	–	73 00	–	–	–	–	–
Washington, Machias Valley	10 00	15 00	17 00	–	26 00	–	–	–	–	–
Washington, Calais Fair Association	54 00	33 00	125 00	20 00	–	–	10 00	–	–	–
York, Shapleigh and Acton	–	–	–	–	6 00	29 50	–	41 00	35 00	11 00
York, Cornish Agricultural Association	68 00	181 00	90 00	12 00	132 00	65 00	4 00	20 00	72 00	73 00
York, Berwick Poultry Association	–	–	–	–	–	–	–	–	–	–
York, Grangers' Fair Association	4 00	10 00	7 00	3 00	35 00	–	–	5 00	–	45 00
York County Poultry Association	–	–	–	–	–	–	–	–	–	–
	$3,024 50	$5,666 20	$2,234 85	$2,025 00	$1,141 75	$865 15	$174 00	$705 25	$1,350 91	$2,312 25

ANALYSIS OF AWARDS—Concluded.

Name of Society.	Amount of premiums awarded sheep.	Amount of premiums awarded swine.	Amount of premiums awarded poultry.	Amount of premiums awarded grain and root crops.	Amount of premiums awarded fruit and flowers.	Amount of premiums awarded bread and dairy products.	Amount of premiums awarded honey, sugar and syrups.	Amount of premiums awarded agricultural implements.	Amount of premiums awarded household manufacturers and needle-work.	Amount of premiums awarded objects not named above.	Total amount of premiums and gratuities awarded.
Maine State Agricultural	$860 00	$243 00	$546 25	$280 00	$295 50	$396 00	–	–	$237 50	$250 00	$5,873 75
Eastern Maine Fair Association	290 00	28 00	249 50	175 80	288 25	–	$29 50	–	235 10	327 00	2,423 15
Central Maine Fair Company	524 50	195 00	762 25	87 25	207 50	325 00	56 00	–	416 90	830 00	5,435 40
Maine State Pomological	–	–	–	–	1,172 50	–	–	–	–	–	1,172 50
Androscoggin, Greene Town Fair Association	–	–	–	11 00	13 50	4 50	–	–	–	8 25	85 25
Aroostook, Northern Maine Fair Association	328 00	205 00	336 10	136 20	193 15	58 25	67 00	–	271 15	553 40	4,739 25
Aroostook, Houlton	267 00	75 00	250 00	67 00	1 00	20 00	30 00	–	225 05	75 00	2,906 05
Cumberland County	21 00	20 00	120 00	25 00	22 25	12 00	18 00	$15 00	80 85	–	1,472 60
Cumberland Farmers' Club	8 00	2 00	45 00	29 50	20 90	7 50	25	–	67 65	25 00	383 30
Cumberland, New Gloucester and Danville	4 00	8 00	21 25	24 90	28 60	5 25	1 00	–	33 70	–	242 20
Cumberland, Freeport Poultry Association	–	–	346 68	–	–	–	–	–	–	3 50	350 18
Cumberland, Little Rigby Park	–	–	2 50	–	–	–	–	15 00	–	53 00	133 50
Franklin County	110 75	7 50	103 90	40 30	64 40	20 00	2 25	–	131 20	81 25	1,659 05
Franklin, North	21 75	7 75	5 00	12 15	12 55	2 00	1 00	–	26 80	11 75	328 65
Hancock County	8 00	–	18 50	59 15	35 50	5 80	–	–	43 05	11 75	371 25
Hancock, Eden	3 00	10 00	14 75	90 95	35 50	14 75	–	–	14 10	–	210 80
Hancock, North Ellsworth	–	–	1 50	23 00	28 00	2 00	50	–	17 70	–	102 70
Kennebec, South	–	–	6 50	11 60	9 60	3 50	–	–	34 05	–	455 25
Knox, North	14 50	11 00	18 25	51 15	68 70	5 00	7 00	–	22 17	–	534 02
Lincoln County	–	–	10 50	30 80	32 25	10 50	–	–	43 05	14 00	427 30
Lincoln, Bristol	–	–	18 50	17 25	9 25	1 50	1 00	–	25 05	6 15	125 45
Oxford County	76 00	64 00	157 50	86 75	382 50	29 45	30 00	33 00	111 55	322 00	3,142 66

Oxford, West	35 00	12 00	33 35	37 50	35 80	17 70	18 80	-	144 75	247 00	1,696 30
Oxford, Androscoggin Valley	11 00	9 00	20 00	27 25	23 80	13 00	80	3 00	27 05	317 86	1,065 76
Oxford, North	20 00	16 00	9 75	10 95	18 15	6 50	13 70	-	22 60	36 40	342 30
Oxford, Western Maine Poultry Association	-	-	621 77	-	-	-	-	-	-	-	621 77
Penobscot, West	58 00	33 00	107 25	57 10	61 65	18 55	15 75	-	89 45	73 31	1,021 31
Penobscot, North	-	-	-	5 00	62 00	5 00	-	-	55 25	-	175 75
Penobscot, Orrington	4 00	4 50	5 00	10 65	20 75	1 50	-	-	56 25	12 75	140 15
Penobscot, Bangor Poultry Ass'n	-	-	700 00	-	-	-	-	-	-	-	700 00
Piscataquis County	3 00	4 00	3 25	9 00	17 75	5 00	-	-	14 50	3 50	296 50
Sagadahoc County	186 00	79 50	177 50	154 75	49 50	38 75	12 00	-	98 00	103 57	3,211 57
Sagadahoc, Richmond Farmers' and Mechanics' Club	-	80	1 00	15 45	9 80	1 80	-	-	13 05	3 70	77 25
Somerset County	42 00	1 25	18 75	7 35	5 80	1 00	-	-	28 30	3 90	520 60
Somerset, East	26 00	16 00	80 00	42 00	21 00	21 50	1 35	-	28 70	259 85	822 40
Somerset, Central	145 00	10 00	184 25	28 75	46 00	24 75	1 50	-	34 50	56 25	1,125 50
Somerset, Embden	4 00	-	-	-	-	-	-	-	-	10 00	97 00
Waldo, Belfast Fair Ass'n	-	-	389 25	30 00	1 50	-	-	-	40 50	40 00	537 25
Waldo and Penobscot	11 00	9 00	21 00	30 00	91 50	16 00	1 00	-	75 75	5 00	977 75
Waldo, Unity Park Ass'n	7 00	4 25	25 25	32 50	11 25	10 50	18 50	6 00	60 25	75 75	715 00
Washington County	14 00	3 00	19 75	34 75	16 75	11 50	-	-	54 35	-	279 60
Washington, West	99 00	23 00	26 75	71 75	62 25	16 65	2 00	-	121 20	-	975 60
Washington, Machias Valley	9 00	6 00	85 15	60 50	59 40	16 25	-	5 00	37 00	57 50	453 80
Washington, Calais Fair Ass'n	7 00	18 00	149 70	97 75	59 25	33 00	-	-	171 10	39 75	861 55
York, Shapleigh and Acton	1 00	-	18 00	90 00	45 00	15 25	-	-	50 00	55 00	400 75
York, Cornish Agricultural Ass'n	-	12 00	98 00	9 00	17 75	2 50	18 00	-	35 10	-	947 35
York, Berwick Poultry Ass'n	-	-	134 00	-	-	-	-	-	-	-	134 00
York, Grangers' Fair Ass'n	-	2 00	44 00	18 00	4 50	1 75	-	-	7 00	3 50	253 75
York County Poultry Ass'n	-	-	688 25	-	-	-	-	-	-	-	688 25
	$3,218 50	$1,139 55	$6,695 40	$2,139 75	$3,662 55	$1,201 45	$346 90	$77 00	$3,301 27	$3,976 64	$51,713 07

FINANCES.

Name of Society.	Amount received from State.	Receipts for membership.	Receipts from loans.	Receipts from entry fees for trotting purses.	Receipts from all other sources.	Total receipts.
Maine State Agricultural	$2,500 00	$20 00	-	$2,752 00	$16,193 67	$21,465 67
Eastern Maine Fair Association	1,618 00	-	-	1,150 50	12,145 15	14,913 65
Central Maine Fair Company	2,500 00	-	$3,300 00	1,816 60	11,943 79	19,560 39
Maine State Pomological	2,000 00	228 00	-	-	1,078 00	3,306 00
Androscoggin, Greene Town Fair Association	27 34	-	-	-	119 59	146 93
Aroostook, Northern Maine Fair Association	1,817 30	32 00	3,500 00	1,802 00	9,558 69	16,709 99
Aroostook, Houlton	-	-	-	-	-	-
Cumberland County	521 62	20 00	-	345 00	5,389 26	6,275 88
Cumberland Farmers' Club	200 69	70 50	-	345 00	1,903 34	2,519 53
Cumberland, New Gloucester and Danville	148 15	35 00	-	232 50	1,162 35	1,578 00
Cumberland, Freeport Poultry Association	197 00	19 00	75 00	-	300 86	591 86
Cumberland, Litt e Rigby Park	55 58	-	-	158 75	951 93	1,166 26
Franklin County	758 25	741 00	-	680 00	35 50	2,214 75
Franklin, North	155 51	309 00	400 00	160 00	780 34	1,804 85
Hancock County	201 02	-	-	242 50	1,937 81	2,381 33
Hancock, Eden	120 25	-	-	125 00	1,254 35	1,499 60
Hancock, North Ellsworth	52 45	-	-	-	87 55	140 00
Kennebec, South	165 18	-	250 00	6 25	923 08	1,344 51
Knox, North	233 48	5 00	300 00	10 00	2,459 85	3,008 33
Lincoln County	144 19	-	400 00	81 15	1,739 89	2,365 23
Lincoln, Bristol	55 00	1 25	200 00	-	363 21	619 46
Oxford County	1,385 62	37 00	-	730 00	7,203 80	9,356 42
Oxford, West	574 25	56 00	-	176 00	4,579 55	5,385 80
Oxford, Androscoggin Valley	331 71	4 00	900 00	600 00	2,970 00	4,805 71
Oxford, North	150 70	10 00	-	125 00	653 02	938 72
Oxford, Western Maine Poultry Association	307 55	14 50	-	-	864 70	1,186 75

Penobscot, West	519 12	46 00	12 00	315 00	2,351 08	3,243 20
Penobscot, North	63 78	1 00	-	282 50	1,550 00	1,897 28
Penobscot, Orrington	52 23	-	-	83 25	777 98	913 46
Penobscot, Bangor Poultry Association	241 42	-	-	-	407 15	648 57
Piscataquis County	136 08	-	-	119 62	1,111 67	1,367 37
Sagadahoc County	1,357 73	30 00	5,100 00	1,125 00	7,691 38	15,304 11
Sagadahoc, Richmond Farmers' and Mechanics' Club	33 35	50	-	-	103 50	137 35
Somerset County	131 48	-	265 00	220 00	789 70	1,406 18
Somerset, East	256 17	20 00	500 00	77 50	1,817 14	2,670 81
Somerset, Central	475 66	70 00	-	427 50	2,493 33	3,466 49
Somerset, Embden	18 68	-	-	-	98 74	117 42
Waldo, Belfast Fair Association	-	-	-	330 00	1,650 13	1,980 13
Waldo and Penobscot	-	-	-	-	-	-
Waldo, Unity Park Association	288 90	-	-	122 00	1,175 00	1,585 90
Washington County	-	7 00	-	75 00	1,078 15	1,160 15
Washington, West	449 27	2 00	-	340 00	2,802 13	3,593 40
Washington, Machias Valley	-	420 00	-	120 38	2,618 41	3,158 79
Washington, Calais Fair Association	429 18	-	-	962 50	4,358 62	5,750 30
York, Shapleigh and Acton	181 75	182 00	60 00	-	57 58	481 33
York, Cornish Agricultural Association	441 16	-	400 00	560 00	2,901 97	4,303 13
York, Berwick Poultry Association	76 08	15 00	75 00	-	184 25	350 33
York, Grangers' Fair Association	-	-	-	120 00	841 23	961 23
York County Poultry Association	-	101 00	-	-	854 25	955 25
	$21,372 88	$2,496 75	$15,737 00	$16,818 50	$ 124,312 67	$180,737 80

FINANCES—Concluded.

Name of Society.	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.
Maine State Agricultural	$1,150 00	$4,875 00	$4,181 66	$5,696 65	$21,777 06	$66,684 00	$12,500 00
Eastern Maine Fair Association	2,500 00	2,900 00	5,650 00	354 57	13,827 72	45,000 00	1,500 00
Central Maine Fair Company	-	3,260 00	10,147 87	969 47	19,812 74	-	4,098 98
Maine State Pomological	-	-	-	1,555 78	2,728 28	-	-
Androscoggin, Greene Town Fair Association	-	-	31 00	-	116 25	6 00	-
Aroostook, Northern Maine Fair Association	2,076 13	3,550 00	3,289 82	3,054 79	16,709 99	42,000 00	10,000 00
Aroostook, Houlton	-	-	-	-	-	-	-
Cumberland County	413 52	1,500 00	776 09	1,363 67	5,525 88	7,400 00	800 00
Cumberland Farmers' Club	131 55	800 00	299 64	830 85	2,445 34	3,000 00	300 00
Cumberland, New Gloucester and Danville	-	586 00	-	361 46	1,189 66	3,500 00	-
Cumberland, Freeport Poultry Association	-	-	130 14	-	480 32	300 00	75 00
Cumberland, Little Rigby Park	60 00	725 00	277 76	-	1,196 26	1,800 00	30 00
Franklin County	600 00	1,700 00	-	-	3,959 05	20,000 00	323 43
Franklin, North	100 00	356 75	324 26	785 39	1,895 05	2,500 00	2,500 00
Hancock County	163 36	887 50	1,040 84	-	2,462 95	4,500 00	-
Hancock, Eden	125 00	298 28	475 50	48 93	1,158 51	3,000 00	650 00
Hancock, North Ellsworth	-	-	74 00	-	176 70	1,000 00	100 00
Kennebec, South	-	137 50	122 33	599 81	1,314 89	1,000 00	835 00
Knox, North	113 95	411 58	771 00	901 65	2,732 20	1,500 00	350 00
Lincoln County	300 00	395 66	300 00	-	1,422 96	2,250 00	743 90
Lincoln, Bristol	301 55	-	163 66	22 95	613 61	1,200 00	200 00
Oxford County	1,471 78	1,900 00	1,777 25	654 42	8,946 11	12,000 00	-
Oxford, West	300 00	1,200 00	400 00	98 00	3,694 30	8,000 00	-
Oxford, Androscoggin Valley	1,000 00	1,400 00	337 98	917 30	4,721 04	6,000 00	1,800 00
Oxford, North	100 00	300 00	200 00	-	942 30	1,500 00	-
Oxford, Western Maine Poultry Association	40 00	-	219 48	120 13	1,001 38	350 00	-

Penobscot, West	363 07	810 00	310 45	229 25	2,734 08	5,150 00	4,782 00
Penobscot, North	100 00	650 00	400 00	-	1,325 75	3,000 00	-
Penobscot, Orrington	-	222 50	110 00	400 80	873 45	1,800 00	1,100 00
Penobscot, Bangor Poultry Association	-	-	-	-	-	500 00	-
Piscataquis County	-	519 25	553 62	-	1,369 37	-	2,800 00
Sagadahoc County	500 00	2,200 00	500 00	900 00	7,311 57	10,000 00	3,900 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	-	-	54 85	-	132 10	-	-
Somerset County	-	550 00	226 00	154 65	1,451 25	-	800 00
Somerset, East	184 96	1,175 00	400 85	112 60	2,695 81	2,200 00	1,385 29
Somerset, Central	464 20	1,220 00	789 02	-	3,598 72	-	2,500 00
Somerset, Embden	-	-	8 50	-	105 50	5 00	-
Waldo, Belfast Fair Association	400 00	800 00	242 88	-	1,980 13	200 00	-
Waldo and Penobscot	-	340 01	296 75	1,660 36	3,274 87	5,000 00	2,010 00
Waldo, Unity Park Association	250 00	600 00	275 00	-	1,840 00	-	279 10
Washington County	91 30	350 75	188 24	351 50	1,261 39	-	200 00
Washington, West	358 43	1,200 00	958 33	350 00	3,842 36	1,926 00	1,500 00
Washington, Machias Valley	325 00	922 88	1,891 12	-	3,592 80	-	434 01
Washington, Calais Fair Association	150 00	2,250 00	1,805 31	683 44	5,750 30	12,500 00	5,220 40
York, Shapleigh and Acton	-	-	20 00	19 00	439 75	2,000 00	-
York, Cornish Agricultural Association	44 14	1,180 00	1,218 45	893 58	4,283 52	4,500 00	400 00
York, Berwick Poultry Association	-	-	161 70	50 31	346 01	245 00	105 00
York, Grangers' Fair Association	-	300 00	83 15	226 80	863 70	-	-
York County Poultry Association	732 50	-	156 00	117 75	1,694 50	732 50	732 50
	$14,910 44	$42,473 66	$41,640 50	$24,485 86	$171,617 48	$284,248 50	$64,954 61

Special Report

OF THE

College of Agriculture of the University of Maine

FOR THE

Commissioner of Agriculture

FOR THE YEAR 1915.

THE WORK OF THE COLLEGE OF AGRICULTURE OF THE UNIVERSITY OF MAINE IN 1914.

The work of the College of Agriculture lies along two distinct lines; the teaching of resident students, and extension service. The former aims to train young men for service as farmers, teachers of agriculture and the allied sciences in schools and colleges; for the business and profession of forestry; and to prepare young women to become teachers of home economics and to comprehend the problems of administration in the home and public institutions. The latter aims to spread and set at work agricultural truths among those who cannot attend the regular college courses. This report will treat of these two lines of work.

REGISTRATION OF STUDENTS.

The following table comparing the registration in 1914 with that of 1912 will show the constant and gratifying increase in the number of students enrolled in the various courses.

TABLE I.

Courses	1912	1914	Gain	Percentage gain or loss
Graduate Courses	0	7	7	
Four Years' Courses	182	231	49	26.9
Two Years' Courses	61	67	6	9.8
Total	243	305	62	25.5

TABLE II.

Classification by Counties.

Maine by Counties:	
Androscoggin	23
Aroostook	10
Cumberland	38

Franklin	12
Hancock	8
Kennebec	18
Knox	5
Lincoln	3
Oxford	14
Penobscot	51
Piscataquis	11
Sagadahoc	5
Somerset	9
Waldo	9
Washington	15
York	13
Other States	61
Total	305

It should be very gratifying to the people of the State of Maine to know that a very large percentage of the graduates from the College of Agriculture are engaged in some agricultural pursuit.

The following table should prove of interest.

TABLE III.

Percentage of Distribution of Graduates from the Two and Four Year Courses According to Present Vocation.

Farming	60.6
Dairy Manufactures and Supplies	3.4
Cow Test Associations	1.7
Agricultural Extension Service	2.9
Teaching and Experimentation	11.4
State and United States Department of Agriculture	5.8
Agricultural Editors	1.2
Total in Agricultural Lines	87.0
Business	6.5
Professions	6.5
Total in all Lines	100.0

The data given above shows that eighty-seven per cent of the graduates who have been trained in the science of farming are actually using their education either in farming or in the furthering of that industry.

COLLEGE CURRICULA.

Several important changes have been made in the agricultural curricula, all aiming to give the student greater opportunity for specializing within the curriculum in which he is registered and also to increase the teaching efficiency of the various departments.

The growing demand for teachers of agriculture in the secondary schools has called for a curriculum especially suited to the needs of this class of students.

Particular attention is being paid to the foundation of a course for the growing number of students who desire to specialize in market gardening and landscape gardening. The development of the Horticultural department is being shaped toward this end.

DEPARTMENTS OF INSTRUCTION.

Teaching Force: Two additional instructors have been placed on the teaching force during this college year: Mr. Alexander Lurie in Horticulture and Mr. Sidney Winfield Patterson in Agricultural and Biological Chemistry. The former was added as a step in the development of the landscape gardening courses referred to above and the latter to more efficiently handle the increasing number of students enrolling for courses in that department.

Resignations were responsible for several other changes in the personnel of the teaching faculty. The position as head of the Home Economics Department was vacated in June by the resignation of Professor Palmer but the college was very fortunate in securing a woman exceptionally well qualified for that position, Professor Frances R. Freeman.

The resignation of Mr. Aubry, instructor in Animal Industry in charge of Poultry Husbandry work, necessitated a change in that department. The promotion of Mr. Eric N. Boland to fill this position and the appointment of Mr. Neil C. Sherwood to the position vacated by Mr. Boland filled the vacancies in this department.

Laboratories: Although the number of students has increased considerably the laboratories have not been enlarged owing to a lack of space. Several departments are very cramped for room and within a short time will need much more room than is now available. The laboratories coming under this class are: Farm crops, farm machinery, horticulture, dairy and poultry husbandry.

The field laboratories of the agronomy and horticultural departments have been much enlarged to meet the demands of the increasing number of students taking these courses.

The Forest Nursery established by the last legislature is proving a success and in the course of two years the Department of Forestry should have seedlings ready for distribution.

The greenhouse has been placed under the immediate direction of the Horticultural Department and is increasingly used by classes. It is hoped to greatly enlarge these laboratories.

The Biology Department laboratory space has been very much enlarged and even with the increased space it is not adequate to accommodate all students of whom this work is required.

Equipment: Small additions were made to the class room and laboratory equipment of each department. The Agronomy Department in particular has added considerable much-needed equipment to the crops laboratory.

SHORT COURSES.

Following the usual custom, short winter courses in General Agriculture, Dairying, Horticulture, and Poultry Husbandry were held during January and February. The popularity of these courses is increasing as the farmers of the state realize the opportunity to get an intensely practical course of study in the principles and practices of modern agriculture.

An inovation this year which proved to be a decided success was the short course offered in sewing by the department of Home Economics. It served a double purpose of giving the high school girls training in sewing and the senior students in Home Economics considerable practice in teaching. The results were very gratifying.

Attendance at Short Courses:

Short courses in Agriculture	68
Short courses in Sewing	29
Total	97

FARMERS' WEEK.

Farmers' Week, in addition to being a short course in agriculture, is now recognized as one of the most important agricultural events of the year, and hundreds of farmers come annually from all sections of the state to attend the lectures and demonstrations and to take part in the discussions. The program which is being enlarged each year contained for the last Farmers' Week more than one hundred lectures and demonstrations, participated in by more than fifty speakers. The teaching force was made up of college teachers, experts on rural problems, experiment station experts, successful farmers, and women experts on household problems.

The fact that there were 375 persons in attendance attests to its value in spreading agricultural truths and furnishing a "get together" period for the people of the state.

EXTENSION SERVICE.

The Agricultural Extension Service at the University which had a small beginning in 1902 has grown to great proportions. Calls for help in solving agricultural problems are coming in from all quarters of the state and the work is limited only by a lack of funds.

Function: The function of the College Extension Service is something more than the mere promotion of agriculture; it is the organization and development of the industry. It deals with the concrete. It aims not only to spread agricultural truths but to set them at work. The Extension Service aims to fulfil its purpose by giving instruction and practical demonstrations in agriculture and home economics in the several communities of the state to persons not attending or resident students in the College of Agriculture.

Organization: The Extension Service is organized on the project plan and a detailed account of the several projects will be noted below. The Extension force at the present time in addition to clerical help consists of a Director, an Assistant Director, Leader of Boys' Agricultural Club Work, Leader of Girls' Agricultural Club Work, Instructor in Poultry Husbandry, Agent in Charge of Farm Management Demonstrations, and nine agents in charge of Farm Demonstration Work in as many counties. In addition, the service is actively participated in by the entire faculty of the College of Agriculture and by several members of the faculties in the other colleges of the University.

Funds: The general extension funds come from the annual appropriation allotted the College of Agriculture from the general University funds.

In the latter part of 1912 the coöperation of the General Education Board made possible the establishment of Farm Demonstrations, a line of work the college had long desired to undertake. The funds coming from this source are supporting the work of six county agents and the Boys' and Girls' Club Work at the present time.

The Farm Management Demonstration Work is supported coöperatively by the United States Department of Agriculture and the College of Agriculture.

Under the Smith-Lever Act work has been started in three counties. If the state coöperates to the fullest extent allowed under the provisions of this Act work will be started in all of the remaining counties of the state, during the next few years.

The Lever Agricultural Extension Act provides for coöperative agricultural extension work between the agricultural colleges in the several states receiving the benefits of an Act of Congress approved July second, eighteen hundred and sixty-two, and acts supplementary thereto, and the United States Department of Agriculture. The purpose of this act is to aid in diffusing among the people of the United States, useful and practical information on subjects relating to Agriculture and Home Economics.

The Federal Government will give a permanent appropriation of $10,000 annually to each state. An additional appropriation for Maine the second year of $4,389, and each succeeding year thereafter for seven years, an appropriation increasing by $3,657, the amount appropriated for the preceding year, providing the state annually appropriates an amount equal to the increase granted by the Federal Government each year after the first. The final amount which may become available under this Act at the end of ten years is $69,982.

PROJECTS.

Correspondence Courses: These courses continue to be very popular and have proved of real value, especially to those who are unable to attend regular courses offered at the College.

During the past year seventy-five new students have been enrolled. The ten courses offered at the present time are:

Course I. Farm Crops and Crop Production.
Course II. Farm Management.
Course III. Feeding and Breeding of Farm Animals.
Course IV. Poultry.
Course V. Fruit Growing.
Course VII. Home Economics.
Course VIII. Elementary Agriculture.
Course IX. Domestic Science.
Course X. Vegetable Gardening and Small Fruits.
Course XI. Dairy Farming.

Lecture Service: There has been a great increase in the demand for the lecture service of the College. A brief glance at the table below will apprise the reader of the tremendous growth in popularity of these courses.

	Number	Attendance
Lectures in 1912-13	243	23,900
Lectures in 1913-14	436	43,150
Increase	193	19,250
Percentage of Increase	79.4	80.5

A bulletin issued by the College gives full information concerning these courses.

Farmers' Meetings at the University: During the past year the following meetings have been held at the University:

West Penobscot Pomona Grange Field Meeting.
Penobscot Pomona Grange Field Meeting.
Maine Live Stock Breeders' Association Annual Meeting.
Maine Short Horn Breeders' Association Annual Meeting.
Maine Jersey Breeders' Association Annual Meeting.
Maine Ayrshire Breeders' Association Annual Meeting.
Maine Holstein Breeders' Association Annual Meeting.
Maine Guernsey Breeders' Association Annual Meeting.
Maine Federation of Agricultural Association Annual Meeting.
Maine Association of Agricultural Students Annual Meeting.
Boys' and Girls' Agricultural Clubs Annual Meeting.

This action on the part of several farmers' organizations in meeting annually at the College is very helpful as it serves to keep the farmers in close touch with conditions at the College.

Agricultural Organizations: The Extension Service plans to encourage the organization of Neighborhood Clubs. Assistance will be given in the organization of such clubs and speakers will occasionally be furnished for the meetings. The Neighborhood Club in many western states is proving a very efficient means for promoting community interest and pride. Any one interested should write the Extension Service, Orono, Maine, for circular descriptive of the plan of organization and giving suggestive outlines for the club work.

Publications: Following the usual custom "Timely Helps for Farmers" were issued monthly by the Extension Department and mailed to a regular mailing list which contains 3500 names and to others who request them. During the year bulletins and circulars on the following topics were published.

Bulletins:

Lectures and Demonstrations,	July, 1913.
Extension Course in Forestry, J. M. Briscoe,	Sept., 1913.
Plans for Extension Schools,	Oct., 1913.
Young Trees from Nursery to Orchard, B. S. Brown,	Nov., 1913.
Care of Food in the Home, Dorothea Beach,	Jan., 1913.
Notes on House Furnishing, Lillian Randall,	Feb., 1914.
Forest Planting, J. M. Briscoe,	Mar., 1914.
Classified List of American Literature on Forestry Subjects for General Reading and Reference, J. M. Briscoe,	Apr., 1914.
Farm Demonstration Work in Maine, L. S. Merrill and R. W. Redman,	May, 1914.
Plan for the Development of Home Economics along the Line of Practical Education, Cornelia Palmer,	June, 1914.

Circulars:

No. 2. Agricultural Contests for Boys and Girls.
No. 3. Boys' Potato Clubs.
No. 4. Girls' Canning Clubs.
No. 5. Boys' and Girls' Poultry Clubs.

Names will be added to the mailing list upon request and a list of back bulletins available for distribution will be sent to those desiring it.

Advice by Mail: Through this medium the College of Agriculture serves many thousands of farmers each year. This form of Extension Service has developed very rapidly, and deservedly so, for the College desires to be of personal assistance to the man on the farm in solving the problems which he is constantly facing. All inquiries are promptly and cheerfully answered.

Identification of Plants, Diseases and Insects: The Extension Department is always glad to identify weeds, plant diseases and injurious insects and endeavors to advise concerning the best methods of combating them.

In counties where a Farm Demonstration Agent is located the specimens may be turned over to him, or, if this is not convenient, they should be mailed direct to the College. The sender of such samples renders a service not only to himself but also to the University as it serves as information concerning the distribution throughout the state of noxious weeds, insect pests, etc.

Forestry Summer Camp: The Forestry Summer Camp is probably the most important development along the line of extension work in forestry. This two weeks course was introduced to meet the needs of two classes of students, namely: Young men just out of high school who are undecided whether or not to take a professional course in forestry, and more mature men such as guides, patrolmen, cruisers, and those interested in the pulp and paper manufactures.

For the summer of 1914, Mr. Charles E. Adams of Bangor offered his camp at Stacyville, on the East Branch of the Penobscot and about 100 miles north of Bangor. The equipment has been placed at this location and undoubtedly it will become the permanent headquarters for the summer camp course.

The course is open to all men over eighteen years of age and in good health. No tuition is charged, but the expenses of living are divided pro rata among the students in attendance, and this is the only necessary expense. For an outline of the work offered reference may be had to the last annual report of the College of Agriculture in "Agriculture of Maine," Year 1913.

Since this course fills a very distinct place in the educational work of the state it is expected to become very popular as it becomes more generally known.

Farmers' Coöperative Experiments: Coöperative experiments were discontinued this year but the results of the good work accomplished in the past has been very evident. The majority of the farmers heretofore acting as coöperators are planting the seed coming from the coöperative experiments which they had been carrying on.

Boys' and Girls' Agricultural Clubs: The organization of Boys' and Girls' Agricultural Clubs began as a definite line of the Extension Service in August, 1913. At this time a state leader was appointed to direct the work. Potato clubs were organized for the boys and canning clubs for the girls. In 1914 it was found necessary to divide this work and two state leaders were appointed; one in charge of Boys' Clubs; the other in charge of Girls' Clubs.

Members of the Boys' Potato Clubs have grown either one-eighth or one-half acre of potatoes, keeping accounts of all expenditures, including charges for labor, rental of land and supplies, and of all receipts. Each boy was also required to submit, at the end of his season's work, an essay on "How I made and marketed my Crop." Members of the Girls' Canning Club have each raised one-tenth acre of string beans, the product of which they have either sold fresh or in cans. The girls have also been taught to can fruits and vegetables other than those raised by themselves. In other particulars their work is identical with the boys'.

During 1914, thirty-one clubs—twenty-eight potato and three canning clubs were organized. With a few exceptions these clubs have faithfully carried out the plans agreed upon, following instructions sent by the state leader. These clubs represent twenty-eight towns and ten counties. Several poultry clubs have also been started but their organization has not as yet been completed.

Each club has been under the supervision of a local leader. As far as possible these leaders were chosen from among school superintendents, teachers or persons interested in community development. Clubs are usually found more successful where they are connected with an organization such as the school or grange.

In several cases, individuals, granges and banks have offered prizes to be competed for by the club members. This has been of great help in stimulating interest in the movement. Prizes have been offered at local, county and state contests for the following:

Highest Total Score.

Highest Profit.

Highest Yield.

Best Essay.

Best Exhibit.

Reduced rates offered by the railroads made it possible for a large number of young people to attend the First Annual State Contest held at Orono, December 21-23, 1914. Seventy-six boys and girls and ten local leaders were present at this time. The value of this meeting cannot be over estimated.

Extension Schools: Extension Schools are based on the laboratory method which is outlined in the motto "Learn to do by doing." With very few exceptions these are the first laboratory schools ever held in this country but the experience of the last year proved that the "laboratory" plan is much more efficient than others.

To secure a school it is necessary for the community desiring the same to appoint an executive committee of two or three members. This committee should communicate with the Extension Department to secure application and petition blanks and other desired information. It is required that twenty-five signatures be secured, of people who will agree to support the school by regular attendance and proportionate contribution towards paying the local expenses.

The local expenses for these schools are never very great. The highest local expense for any school last year was met by an assessment of ten cents per session for each member of the school.

During the past year four different schools were offered, including the following subjects: Apple Packing, Animal Feeding, Orchard Renovation, and Soil Fertility.

The coming year, at least two new kinds of schools, Farm Crops and Poultry Husbandry, will be offered.

Judging from the intense interest manifested the fourteen schools held last year were a decided success. The number of these schools is limited only by the amount of funds available.

Farm Demonstration Work: Farm Demonstration Work, the first movement of the kind in this section of the United States, is now in its third year. The work is under the direction of county representatives of the Extension Service.

It has now reached such proportions that anything more than a summary will not be attempted in this report.

TABLE IV.

Showing Demonstration Counties and Addresses of Representatives in Charge.

Counties	Name of Agent	Post Office Address
Cumberland	Clarence W. Barber	Portland
Franklin	Wilson M. Morse	Farmington
Hancock	George N. Worden	Ellsworth
Kennebec	Arthur L. Deering	Augusta
Oxford	George A. Yeaton	Norway
Penobscot	Maurice D. Jones	Orono
Sagadahoc	Harold J. Shaw	Bath
Washington	Clarence A. Day	Machias
York	Harold H. Nash	Sanford

TABLE V.

Showing Number and Kinds of Demonstrations in each County.

Kind of Demonstrations.	Names of Counties.						
	Cumberland.	Hancock.	Kennebec.	Oxford.	Penobscot.	Washington.	Totals.
Dairying	–	–	3	–	2	–	5
Potatoes	3	2	4	–	8	12	29
Oats	–	1	3	–	5	4	13
Orchard	–	3	5	34	6	8	56
Small fruit	–	–	1	–	–	–	1
Sweet corn	5	–	6	1	6	–	18
Yellow corn	–	–	1	–	1	–	2
Silage corn	–	–	–	–	2	1	3
Strawberries	6	–	2	2	–	4	14
Blackberries	–	–	–	1	–	–	1
Gooseberries	–	–	–	1	–	–	1
Raspberries	1	1	–	3	–	–	5
Currants	–	–	–	2	-	–	2
Melons	1	–	–	–	–	–	1
Peas	2	2	–	1	2	–	7
Beans	3	1	–	–	–	1	5
Beets	1	–	–	–	–	–	1
Turnips	–	–	–	–	–	2	2
Buckwheat	–	–	–	–	–	1	1
Wheat	–	–	–	–	–	1	1
Cucumbers	–	–	–	–	1	–	1
Cabbage	–	1	–	–	–	–	1
Tomatoes	–	–	–	–	1	–	1
Squash	2	–	–	–	1	–	3
Crop rotation	–	–	–	–	–	6	6
Market gardening	1	–	–	–	–	–	1
Totals	25	11	25	45	35	40	181

The success of the demonstrations has been very gratifying and their influence has spread to hundreds of other farms. The demonstration work is supplemented by various neighborhood meetings and field meetings on the demonstration farms at critical periods in the growth of the crops. The neighbors and all people interested are invited to be present while the agent and demonstrator explain the course pursued in the management of the demonstration and outline further plans for handling the crop. It is aimed to work with neighborhoods and communities rather than with individuals but Extension Representatives are always glad to render all possible assistance in the handling of farm problems, wherever it is desired by either individual farmers or groups of farmers.

It is hoped eventually to establish farm demonstration work in every county in Maine since it appears to be one of the most practical and resultful forms of extension work thus far found, to spread and actually set at work fundamental truths in successful farming.

EMPLOYMENT BUREAU.

The Employment Bureau which was organized two years ago by the Extension Department in coöperation with the Maine Association of Agricultural Students has filled many positions during the past year. It is the aim of this bureau to keep in touch with the graduates from the college and thus be able to make recommendations to those who may require the services of trained and experienced men.

NEEDS OF THE COLLEGE.

In order to keep abreast of the times and to fill the requirements for teaching students and furnishing information to the farmers of the state the college must have new equipment.

The College of Agriculture has many needs but this report will only attempt to set forth those needs that may be classed as *very real* and *pressing*.

First: *Cattle and Horse Barns.* The present cattle and horse barns on the University farm are open to the following criticism:

1. They are not sanitary and cannot be made so except with great expense.

2. They are not of sufficient size to accommodate the live stock now kept on the farm and it is well to point out at this time, that if the Agricultural Experiment Station is to carry out the provision of the Act passed by the last legislature instructing the Station to undertake breeding experiments for the purpose of "Determining the Inheritance of Milk Production," the College will be compelled to rear all the young stock bred on the farm, and this plan makes immediately necessary, additional housing accommodations.

3. They are not planned to economize labor nor can they be so planned.

4. They do not represent a type of barn construction that would be recommended to the farmers of the state by any competent authority.

5. They cannot be used for educational purposes with the large classes of students taking agriculture at this Institution except as examples of what ought *not* to be.

6. They have been condemned by the following Farmers' Organizations of a state wide character:

Maine Dairymen's Association.

Maine Live Stock Breeders' Association

Maine Seed Improvement Association.

Maine Association of Agricultural Students.

Maine Federation of Agricultural Associations.

All of these associations have passed resolutions recommending that the state make appropriations for the building of new cattle and horse barns.

Second: *Dairy Building.* The present dairy building is not of sufficient size to accommodate the students now taking the courses in *dairying.* A certain amount of dairy work is required, and ought to be, of all students in agriculture, and the college is confronted with the very disturbing fact that if enlarged accommodations are not provided within the next year, either the requirement of some of the courses in dairying as a regular part of the agricultural curricula must be abandoned, or a considerable portion of the students must be excused from the requirement. Such action would meet with very serious objections on the part of the farmers of the state and will not be taken by the college unless it is forced to do so.

From the above statement it can be seen that the need for a new dairy building is a *very real need* and should be provided for.

GENERAL INFORMATION.

The University catalog gives a detailed statement concerning entrance requirements for the four year courses in agriculture, forestry, and domestic science. A copy of this volume will be forwarded upon application to the Registrar, University of Maine, Orono.

For two year courses in agriculture no entrance examinations are required. Students fifteen years of age or over who are prepared for advanced grammar or high school work are eligible for registration.

For admission to the two years' course in home economics it is required that students shall be graduated from a recognized high school or its equivalent, and have in addition some practical knowledge of housework.

Information concerning entrance requirements, college expenses and student employment will be forwarded upon application to the Dean of the College of Agriculture, Orono.

SPECIAL REPORT

OF THE

Maine Agricultural Experiment Station

FOR THE

COMMISSIONER OF AGRICULTURE

For the Year 1914

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THE WORK OF THE MAINE AGRICULTURAL EXPERIMENT STATION IN 1914.

DIRECTOR CHAS. D. WOODS.

The year 1914 was the thirtieth year of the Maine Agricultural Experiment Station. It began its work April 1, 1885. The office, laboratories, and poultry plant of the Station are on the campus of the University of Maine, Orono. Its field work is carried out on the two experimental farms, Aroostook Farm situated in Presque Isle, Aroostook county, and Highmoor Farm in Monmouth, Kennebec county. The work on Aroostook Farm is largely with potatoes and small grains. The work on Highmoor Farm is chiefly with apples, oats, beans and sheep. The results of the investigations are published in the bulletins of the Station, in the Journal of Agricultural Research published by the U. S. Department of Agriculture and in different scientific journals in America and abroad. The bulletins of the year contain summaries of the more technical work and a full statement of the more practical studies. These are sent free to all residents of Maine on request and at a nominal price to non-residents so far as the editions will permit.

In the space allotted for this report it would not be possible to more than list the investigations undertaken during the year. Instead of attempting to make a review of the work of the year, a summary is given of the results of some of the matters that are of immediate practical agricultural significance. The practical results of the field trials at Aroostook Farm and Highmoor Farm obtained in 1914 are given in Bulletin 236 of this Station, entitled Field Experiments in 1914.

MILK PRODUCTION AND AGE.

One of the first problems which it was necessary to work out in connection with the studies of the inheritance of milk production, in progress at the Station, was that of the proper correction to apply to milk production records for the changing age of a cow. It is a fact well known to all dairymen that as a cow grows older, up to full maturity, her milk yield increases at each lactation, under normal circumstances. Furthermore, it is well known that after a cow passes a certain age her milk flow begins to fall off with further increase in age. Before any critical study can be made of the inheritance of milk production, upon which any scheme of breeding for improved milk production must be based, it is necessary to have accurate corrections for the effect of age upon milk flow so that cows of different ages may be compared with each other. The work on this problem, which has been very laborious, is now being brought to a close and tables are being prepared by which it will be possible, knowing a heifer's milk record, to read off her probable production as a mature cow. These tables in due time will be published in bulletin form for the different dairy breeds. The work on Holstein-Friesian and Jersey cattle is now practically completed.

An interesting point about this change of milk flow with age is that the increase as the cow grows older after her first lactation is not regular. Instead it follows what is known in mathematics as a logarithmic curve. In other words, the amount of milk produced by a cow in a given unit of time is a logarithmic function of the age of the cow. This law may be stated verbally in the following way: Milk flow increases with increasing age but at a constantly diminishing rate (the increase at any given time being inversely proportional to the total amount of flow already attained) until a maximum flow is reached. After the age of maximum flow is passed the flow diminishes with advancing age at an increasing rate. The rate of decrease after the maximum is, on the whole, much slower than the rate of increase preceding the maximum. In general this law applies to the absolute amount of fat produced in a unit of time as well as to the milk.

In connection with the establishment of this law of relation of milk flow to age it has been necessary to work out in the laboratory a new method of dealing with such figures and a paper is now in press having the title "The Fitting of Logarithmic Curves by the Method of Moments."

This work furnishes a good example of the fact that a scientific study of agricultural problems may wander into fields quite far removed from what is ordinarily thought of as agricultural science. At first thought one would hardly suppose that the application of pure mathematics would be necessary to make a reasonable prediction of the probability that a cow which gave a certain amount of milk at her first lactation as a heifer would be a profitable or an unprofitable cow to keep to maturity. Yet, as a matter of fact, the only scientific way by which to solve this important problem is by the application of pure mathematics, and it is this which has been done in the department of biology at this Experiment Station. When the tables spoken of above are completed and published in bulletin form it will be possible for any farmer who keeps a record of the milk production of his heifers at their first lactation to predict, with an average error of rather less than 2 per cent, what the production of the same cow will be when she is seven years old. Furthermore it will be possible for a dairyman to give each one of his cows an absolute rating in comparison with advanced registry animals of the same breed at any given age. If he will keep a milk record, he can with the help of these tables say whether or not a particular cow is better or worse, and by what proportion, than the average of advanced registry cows of the same age.

Double-Yolked Eggs.

Since everyone has seen quite a number of double-yolked eggs it is quite naturally and rightly concluded that they are not unusual. However, we do not usually consider how many single yolked eggs we see to every one that is double-yolked. The Station flock produces 531 single yolked eggs to every double-yolked egg. That is, only two-tenths of one per cent of the eggs are double-yolked. The ratio of double to single yolked eggs is less than twice as high as the ratio of twin to single births in the human family.

Recent study at this Station shows that all birds are not equally likely to lay double-yolked eggs. In fact the great majority of birds never lay anything but single yolked eggs. There are, however, birds which possess a tendency to lay double-yolked eggs. Such an individual may produce several such eggs. It has been further found that a bird which possesses the tendency to lay double-yolked eggs is not equally likely to produce them at any age. She is most likely to produce them when she is young. Eighty per cent of all the double-yolked eggs produced by the Station flock are produced by birds less than eight months old. We have only a very few records of birds which have laid double-yolked eggs after their first adult molt.

It has been usually supposed that double-yolked eggs are caused by the simultaneous entrance of two yolks into the egg tube and the consequent common passage of the two yolks through the duct. A careful study of the structure of all the double-yolked eggs produced by the Station flock shows that in only a small per cent (16) of the cases have the two yolks passed the entire length of the duct together. In such cases the two yolks are enclosed in a common thin layer of white membrane, the chalazal membrane, and have only one pair of chalazae. They also have common albumen envelopes as well as a common egg membrane and shell.

Since the formation of each egg part (chalazal membrane and chalazae, thick albumen, egg membrane, and shell) is confined to a particular part of the oviduct, a study of the number of the secondary parts which are common to the two yolks of a double-yolked egg shows the level of the duct where the two yolks came together. Such a study carried out on all double-yolked eggs produced by the large flock of birds owned by this Station shows that the two yolks unite at every level of the duct from the mouth of the funnel to the very end of the albumen secreting portion. It shows further that the number of eggs of any given structure observed is exactly equal to the number expected on the assumption that the union of the two yolks occurs indiscriminately at every level of the duct from the mouth of the funnel to the beginning of the isthmus or egg membrane secreting portion. When two eggs unite after the first egg has received its membrane the result is two eggs at the same time.

The structure of the egg has shown us that in a majority of cases the two yolks of a double-yolked egg have not passed the entire length of the duct together. On a moment's reflection we see that there was never any *a priori* reason for the assumption that the cause for the production of a double-yolked egg was necessarily the simultaneous discharge of two yolks from the ovary into the oviduct or egg tube. The only condition necessary for two yolks to be enclosed in the same egg membrane is that they entered the membrane secreting portion of the oviduct together. There are at least three possibilities beside simultaneous ovulation which may bring two yolks together before they reach this portion of the oviduct. First, the first yolk may be delayed at any level of the duct forward to the point where the egg membrane begins to be secreted; second, the first yolk may be returned up the oviduct and then come back in company with the second yolk; and, third, a yolk may be ovulated into the body cavity and picked up by the oviduct shortly before or after the ovulation of another yolk. It is, therefore, unnecessary to assume that the production of a double-yolked egg represents simultaneous or even an abnormally rapid succession of ovulations, since any of these delays may have been as long as the normal period between ovulations.

A study of the structure of the eggs and the egg records of the birds leads to the conclusion that double-yolked eggs do not necessarily represent two simultaneous or even nearly simultaneous ovulations; but in about one-third of the cases of double-yolked eggs produced at this Station the time between the two ovulations must have been unusually short, since the birds which laid these double-yolked eggs each laid a normal egg on the preceding day. A study of the egg structure of these double-yolked eggs where the time between the ovulations is known to have been abnormally short shows that the ovulations have been simultaneous in only a small per cent of the cases. In fact the two yolks have come together at every level of the duct in front of the beginning of the isthmus.

A study of the ovaries of birds which had recently produced double-yolked eggs showed that each of the two yolks was discharged from a normal separate follicle exactly as are the yolks of successive single yolked eggs.

From these recent studies of double-yolked egg production it is certain that some individual hens have an inherent tendency to lay double-yolked eggs while a great majority of hens never lay anything but normal single-yolked eggs. A bird with the tendency to double-yolked production is more likely to produce double-yolked eggs when she is quite young than later in life.

The two yolks of a double-yolked egg may enter the oviduct simultaneously and pass the entire length of the duct together receiving from the duct an entire common set of egg envelopes, or they may come together at any level of the oviduct from the funnel mouth to the beginning of the isthmus. It is highly probable that the two ovulations may be either simultaneous or that they may be separated by any period up to the normal period between ovulations.

The production of a double-yolked egg is evidently seldom caused by the simultaneous discharge of two normal separate follicles into the oviduct. Usually it is caused by the successive discharge of separate follicles at times varying from simultaneity to the normal period, and by the subsequent union of the eggs in the duct due to a difference in the rate of passage of the successive eggs.

Practical Hints on Breeding for Egg Production.

For many years there has been in progress at the Station an investigation of the laws of inheritance of egg producing ability in poultry. The following suggestions, compiled from Bulletin 231 of this Station, are offered as a basis for the improvement of poultry in egg production by breeding.

1. Selection of all breeding birds *first* on the basis of *constitutional vigor and vitality* making the judgment of this so far objective as possible. In particular the scales should be called on to furnish evidence. (a) Do not use as a breeder a cockerel which (in the case of Plymouth Rocks or Rhode Island Reds or Wyandottes) has not attained a weight of at least eight pounds at ten months of age, and better, nine pounds. Use no pullet as a breeder which does not weigh at least five and one-half pounds at the same age. (b) Let all deaths in shell, and chick mortality, be charged against the dam, and only those females used as breeders a second time which show a high record of performance in respect to the vitality of their chicks, whether in the egg or out of it. This constitutes one of the most valuable measures of constitutional vigor and vitality which we have. If for no other reason than to measure this breeding performance, a portion of the breeding females each year should be pullets. In this way one can in time build up an elite stock with reference to hatching quality of eggs and vitality of chicks. (c) Let no bird be used as a

breeder which is known ever to have been ill, to however slight a degree. In order to know something about this, put an extra leg-band on every bird, chick, or adult, when it shows the first sign of indisposition. This then becomes a permanent brand, which marks this individual as one which *failed* to a greater or less degree, to stand up under its environmental measures of constitutional vigor.

2. The use as breeders of such *females* only as have shown themselves by trap-nest records to be high producers, since it is only from such females that there can be any hope of getting males capable of transmitting high laying qualities.

3. The use as breeders of such *males* only as are known to be the sons of high producing dams, since only from such males can we expect to get high producing daughters.

4. The use of a pedigree system, whereby it will be possible at least to tell what individual male bird was the sire of any particular female. This amounts, in ordinary parlance, to a *pen* pedigree system. Such a system is not difficult to operate. Indeed, many poultrymen, especially fanciers, now make use of pen pedigree records. It can be operated by the use of a toe-punch. All the chickens hatched from a particular pen may be given a distinctive mark by punching the web between the toes in a definite way.

5. The making at first of as many different matings as possible. This means the use of as many different male birds as possible, which will further imply small matings with only comparatively few females to a single male.

6. Continued, though not too narrow, *inbreeding* (or line breeding) of those lines in which the trap-nest records show a preponderant number of daughters to be high producers. One should not discard all but the single best line, but should keep a half dozen at least of the lines which throw the highest proportions of high layers, breeding each line within itself.

Items 4, 5 and 6 imply the carrying over of a considerable number of cockerels until some judgment has been formed of the worth of their lines, through the performance at the trap-nest of their sisters.

Item 6 assumes, as an absolutely necessary prerequisite that item 1 will be faithfully and unfailingly observed.

The plan of breeding for egg production above set forth, which involves nothing in principle or practice which any poultryman cannot put into operation will not fail, if consistently and intelligently followed for a period of years, to bring about a material increase in the productiveness of the flock. The evidence which leads to this conviction is the best of all evidence; the plan has been tried and it works.

The Color of the Hen's Legs a Help in Picking Out the Layers.

For some time past there has been in progress at the Station an investigation of the cause of the different shank colors observed in different breeds and different individuals of the domestic fowl. The results of this investigation are now in hand, and a bulletin on the subject will shortly be issued. As this bulletin will be of a rather technical character it is thought desirable to call attention at this time to some of the more important, non-technical and practical features growing out of this work.

It is a well known fact to every poultryman and every visitor to a poultry show that different breeds of fowls have characteristically different colors of the skin. In the United States generally yellow skinned birds are preferred over white skinned ones for market purposes. As consequence of this preference nearly all of the so-called American breeds such as, for example, Plymouth Rocks, Wyandottes, Rhode Island Reds, etc., have a distinct yellow color of the skin. Correlated with this general yellow skin color these same breeds of poultry have characteristic yellow shanks. This color of the shank is one to which a good deal of attention is given, both by the judges in the show room and by the expert poultryman in picking out stock for his pens. A clear, bright yellow leg is always preferred in these breeds by the show room judge.

In the matter of this preference for yellow skin color in its poultry the United States stands practically alone. Nearly all of the European countries prefer a white skinned bird for table purposes. In consequence the birds for table use on the continent of Europe and in England belong to breeds characterized by white skin color, and usually by white shank color, such as, for example, is seen in the White Orpingtons.

The cause of the skin color of birds is really a layer of colored fat which lies in and below the skin. This fat in the

American breeds is colored by a particular kind of yellow fatty pigment known as a lipochrome pigment. While the matter has not yet been completely investigated it is very probable that the yellow color of chicken fat which gives the color to the skin is due to the same pigment which gives the yellow color to the milk of the Jersey or the Guernsey cow. Recent experiments on the color of milk in cattle have demonstrated that there this pigment is chemically precisely the same as that which gives the yellow color to the common carrot. This coloring matter is known by the name carotin. In the white skinned breeds of poultry this yellow pigment is very nearly, or completely, absent, with the result that while the skin fat is there just as in the yellow skinned breeds it is not colored. Also probably this same coloring matter gives the yellow color to the yolk of the egg.

This last consideration is one which calls attention to the practical bearing of these results on shank color. It is a well established fact, both in cattle and in poultry, that when the food does not supply a sufficient amount of this yellow coloring matter carotin for the product, whether milk or eggs, the animal then draws on its own body fat for the further supply of this coloring matter. This results in a bleaching of the body fat of its yellow color while keeping up the color of the milk or the eggs. From this fact it results that the general skin color, and particularly the shank color, of a hen having naturally yellow shanks is much bleached out after the hen has been laying heavily, and furthermore, the heavier the laying has been the greater will be the amount of bleaching observed. In consequence of this it is possible to go through a flock at the end of a laying year and pick out at once by the color of the shanks those birds which have been extremely heavy layers from those which have been drones. The drones will be the birds which at the end of the season have bright yellow legs, such as one is accustomed to see in pullets which have not yet begun to lay. On the other hand, birds which have done a hard year's work and produced many eggs will have shanks completely white or nearly so. Examination at this Station of many hundreds of birds, whose trap nest records are known, makes it possible to say positively that no bird which has been a high producer will have bright yellow legs at the end of the laying season. "Two hundred egg" hens always have white legs at the end of their pullet year. This point is one which may be of a great value to the poultryman when he is culling his flock in the fall and deciding which of his pullets he will keep over to use as breeders the next year. If he has no trap nest records the color of the shanks furnish him one of the best indications he can have as to the way in which these pullets have laid during their first year of life. His first selection should always, of course, be on the strength and constitutional vigor, but after having picked out the good strong healthy birds he should then choose from among those the ones which show the whitest legs. Poultrymen often make a mistake on this point. One frequently hears of a poultryman practicing just the opposite—that is, when he culls his pullets in the fall for the breeders of the next year, he will pick out carefully those which have yellow legs. By doing this he is systematically picking out the poorest layers in his flock to use as breeders, whereas, if he takes those with the white legs he is systematically picking out his best layers for breeding purposes.

Maine Station Methods Win in Feeding Hens for Egg Production.

In connection with the Second National Egg Laying Contest carried out by Director T. E. Quisenberry at the Missouri Poultry Experiment Station a 12 months test was made, during the past year, of different methods of feeding for egg production. In the fall of 1912 ten pens of pullets were selected for this test. The birds in these pens were as uniform a lot as it is possible to select. The methods of housing were the same in all cases. The only variable factor was the different methods of feed used in the different cases. Five of the pens were Single Comb White Leghorns and five were Buff Orpingtons. The ten different methods of feeding used and the results obtained are shown in the following table.

Pen.	Ration Fed.	Eggs.
63	Fed according to Maine method	1,598
62	Fed according to New York method	1,522
67	Fed with Norwich feeders	1,510
70	Fed and confined to house continuously	1,495

64	Fed according to Canadian method	1,480
68	Feed kept before them at all times	1,403
69	Fed simple farmer's ration	1,402
65	Fed according to Saylor method	1,399
66	Fed according to any egg farm method	1,318
61	Fed according to Connecticut method	1,232

It will be seen from these figures that the method designated as the "Maine method" won over all the others, the birds in this pen laying 76 more eggs in the year, or more than a half dozen eggs per bird on the average than for any of the other feeding methods. The "Maine method" here referred to is the method of feeding which was first worked out by the Maine Agricultural Experiment Station and described in its bulletins. This method has been used for a number of years with excellent results on the Station's own flock of Barred Plymouth Rocks, and it has been very widely used by poultrymen, not only in this country, but all over the world, with satisfactory results. It is a matter of gratification, however, that this method should take a leading position when subjected to exact comparative test, as in this laying contest.

A brief description of the way this winning pen of birds in the Second National Egg Laying Contest was fed is given below.

The feed of all adult birds, whether pullets or not, consists of three essential parts: (a) the whole or cracked grains scattered in the litter, (b) the mixture of dry ground grains which has come to be generally known as a dry mash, and (c) green food. The component parts of the ration and the methods of feeding them will be considered separately. In addition to the grains and dry mash, oyster shell, dry cracked bone, grit, and charcoal, are kept in slatted troughs, and are accessible at all times. Plenty of clean water is furnished. About five pounds of clover hay cut into one-half inch lengths is fed daily to each 100 birds in the breeding pens during the breeding season. When the wheat, oats and cracked corn are given, the birds are always ready and anxious for them, and they scratch in the litter for the very last kernel before going to the trough where an abundance of feed is in store.

Taking first the dry grains, the following may be said in regard to the method in which they are fed: Early in the morning for each 100 hens, four quarts of whole or cracked corn is scattered on the litter, which is six to eight inches deep on the floor. This is not mixed into the litter, for the straw is dry and light and enough of the grain is hidden so the birds commence scratching for it almost immediately. At 11 o'clock they are fed in the same way two quarts of wheat and two quarts of oats. This is all of the regular feeding that is done.

COMPOSITION OF DRY MASH FED TO LAYING PULLETS.

First month in laying house.

Bran	300 lbs.
Corn meal	100 lbs.
Daisy flour (or other low-grade flour)	100 lbs.
Meat scrap	100 lbs.

Second month in laying house.

Bran	200 lbs.
Corn meal	100 lbs.
Daisy flour (or other low-grade flour)	100 lbs.
Gluten meal	100 lbs.
Meat scrap	100 lbs.

Third month in the laying house.

The mash has the same composition as that of the second month given above *with the addition of 50 pounds of linseed meal.*

Fourth month in the laying house.

The mash has the same composition as that of the second month given above.

Fifth month in the laying house.

The mash has the same composition as that of the third month given above.

From this time on 50 pounds of linseed meal are put into the mash as given for the second month above every alternate month. That is to say, one month linseed meal is fed and the next month it is not.

This dry mash made as described above is kept before the birds all the time in open hoppers.

Beans.

Several years ago the Experiment Station undertook some breeding work with beans. The immediate problem for which the work was undertaken was to procure true-breeding strains of Old Fashioned Yellow Eye beans. A great deal of difficulty has been experienced by bean growers in securing strains which would come even reasonably true to seed. In spite of careful seed selection for many years strains of these beans often continue to throw small numbers of black, solid yellow, mottled or white beans every year. Many of the large growers complain that in order to secure a good price for their crop it is necessary to hand-pick their beans every year.

At the time our work was started it was believed that it would be a relatively simple matter to secure pure-breeding strains but our experience has shown that this is not the case. It was generally believed that the bean flower was normally self-fertilized; that is, the pistil or female portion of the flower was fertilized by pollen from the same flower. It was believed that this fertilization took place before the blossom opened. Three years ago we found that this is not always the case but that cross-pollination could be brought about by bumble-bees.

For this reason it has been necessary to carry on the bean breeding under other conditions. In 1913 there was built at Highmoor a bean cage 25 x 50 feet which was enclosed on both roof and sides with screen wire. This effectually excludes all insects which might cross-pollinate the bean flowers.

Last year (1913) a number of strains of Old Fashioned Yellow Eye beans were grown under this cage. A few of these appeared to be breeding true. These strains have been tested further this year. Those which have proved to be true to type will be multiplied in isolated plots next year so that there will be no danger of crossing. In order to maintain such a strain pure it will be necessary for the grower to plant only one kind of beans or at least to have the different kinds so separated that there will be no danger of crossing by the bumble-bees.

The Station has also been working upon a set of standards for yellow eyed beans. There is a great difference of opinion among the growers of the state as to what is the best type for the Old Fashioned and the Improved Yellow Eye beans. While every grower is entitled to his own opinion as to the best type, yet it is true that certain types bring a much better price on the market. During the past several years both the growers and the dealers have been consulted regarding this question and it is hoped that the data so obtained will aid in establishing better standards for these varieties of beans. The results of these investigations will be published by the Station during the coming year.

In addition to the work outlined above the Station is also attempting to produce new and desirable types of beans by means of controlled hybridization. This work naturally proceeds slowly and it will be several years before any of these new varieties will have been sufficiently tested to be placed before the public.

Oats.

The work with oats at Highmoor has been continued along the same lines as in the past several years. Twenty-two commercial varieties of oats were tested in 1914. In addition 31 new varieties originated in the breeding work of the Station were also tested under field conditions. The season of 1914 was very favorable for oats at Highmoor. The yields were much higher than in any of the preceding years. Individual varieties averaged to yield from 120 to 60 bushels per acre. Seven of the varieties originated by the Station yielded above 100 bushels per acre.

The work of developing new varieties by hybridization was continued. About 8000 second generation hybrid plants were grown this year. The most desirable of these have been selected for further tests and purification next year.

SELECTION EXPERIMENTS.

Another line of investigation has dealt with the question whether it is possible to improve pure lines of oats by continued selection. It has been found that one of the most important means of securing new and improved varieties of oats has been the selection of new strains out of the existing varieties. In doing this work it has been found that the only successful way is to select individual plants and then to multiply the seed of each plant separately. By this means there is obtained what is known as a "pure line." Each pure line is the descendant of a single individual plant. Since the oat flower is always fertilized by its own pollen it follows that each plant in any single pure line has exactly the same hereditary constitution as every other plant.

By the selection and isolation of such pure lines out of standard commercial varieties we have been able to secure new varieties or strains which are far superior to any of the commercial varieties so far tested. The question now arises, can any improvement be made in these pure lines by further selection.

The points in question can perhaps be made clearer by considering what constitutes a commercial variety. To the casual observer a variety may appear to be breeding perfectly true and all the plants may appear to be alike. However, if the plants are examined carefully many differences will be found. Further, if individual plants are selected and the seed of each grown in separate rows it will be found that many of these rows differ greatly in their yield, time of maturity, strength of straw, etc. These differences are transmitted from one generation to the next. Each plant which breeds differently from the others belongs to a different pure line. A commercial variety then consists of a mixture of a large number of pure lines which we may designate by the letters,

A, B, C, D, E, F, . . . etc.

If we select a single plant it will belong to one of these pure lines, for example, C. If we multiply the seed of this plant we may have finally a whole field, all the plants of which belong to this pure line C. If we again select single plants from such a field we still have only the same pure line. If we grow the seed of such selected plants in separate rows there is little or no difference between the rows. The question is, can we improve this pure line C, by selecting year after year the best yielding plants?

Experiments to test this question have been in progress for the past four years. Twenty-eight pure lines coming from 13 different commercial varieties have been used in this work. The method has been to grow short rows of each pure line in the oat garden at Highmoor Farm. All of the rows were grown under as nearly uniform conditions as possible. Each plant was then threshed separately and various data including the height, number of culms, weight of plant, weight of straw and weight of grain were recorded. For planting the next year, individual plants showing the highest and lowest degrees of a given character were chosen. The seed from each of these plants was again sown in short rows and the process repeated the next year. Over 12,000 plants have been grown in this way in the four years.

A careful analysis of this large amount of data has shown that in these experiments *selection within a pure line has not permanently changed any of the characters studied.* Thus plants which have been subjected to three successive selections in the plus direction do not on the average yield better than plants which have been selected in the minus direction for three successive years.

The results of this work are of much importance to the practical oat breeder. It follows that in order to secure improved strains it is only necessary to select individual plants from the commercial fields and then to multiply the seed of each plant separately. Then each of these pure lines must be tested and only the best retained. After a desirable pure line has been isolated it is only necessary to keep it pure and unmixed with other seed. Such a pure line will not deteriorate nor can it be improved by further selection. This greatly simplifies the methods of practical oat breeding. It is now shown that it is useless to continue the expensive methods of selecting year after year within a pure line. In order to get still better yielding strains it is necessary to go back to a commercial field and make new selections with the hope of isolating still better pure lines. Once a pure line is isolated it cannot be improved by further selection.

The Blueberry Maggot the Same as Apple Maggot.

In the spring of 1913 the attention of the Maine Agricultural Experiment Station was called to a certain maggot infesting blueberries in Washington County. Although it was the opinion of the growers that the berries affected were winnowed out in the process of sorting the berries, still their presence caused considerable concern, and in some localities it had become the practice to discontinue canning the fruit late in the season after the maggot became abundant.

Altogether it was a situation that warranted study both in the economic interest of the blueberry industry and from the entomological standpoint, for when the complaints first came in, no one knew anything concerning the identity or habits of the pest.

Accordingly the barrens were visited and about the first of August, flies with banded wings were found to be common about the blueberry bushes. Much to the surprise of the entomologists at the Station these flies proved to be the same species as our common apple pest *Rhagoletis pomonella,* the larva of which is popularly known as the "railroad worm" on account of the trails it makes under the skins of light colored apples. After the middle of August it was not a difficult matter to find infested berries on the plains. When the maggots are small, the fruit attacked cannot be distinguished from a sound one, but usually when they have attained a fair size the fruit becomes very much shrivelled. An infested berry can easily be told by touch, for it feels soft and mushy, and this is the surest external indication that it has been attacked.

When the maggot becomes full fed it leaves the berry by an irregularly shaped hole through the skin and pupates in the ground just as the insect does after leaving an apple.

Maggoty berries were brought to the Experiment Station and cared for in order that the adult insects might be reared. They formed pupae late in the summer which normally would have remained in the ground in that stage until another summer. By keeping them under warmer conditions, however, their development was forced and in early spring adult flies began to emerge from the pupa case which proved to be the same species as those taken on the barrens the summer of 1913, thus establishing beyond a doubt the fact that in Maine the maggot which breeds in blueberries is the common apple maggot, *Rhagoletis pomonella.*

This fly is smaller when developing in blueberries than when it grows in the apple, but otherwise there is no difference. This fact is not surprising as it is common with insects which feed inside vegetable matter to have their size dependent upon the amount of the food supply. The apple maggot has been reported from the huckleberry in New Jersey and Connecticut but this record from Maine is the first account of its accepting the blueberry as a habitation.

It is too soon to predict what can be done by way of control. While the maggots were common on the plains, it should be stated that the blueberries grow so profusely that only a small percentage of the fruit was infested. There seems to be no doubt that much of the defective fruit is winnowed out in the process of cleaning as the infested berries become shrunken and drier than the normal ones.

The common practice of burning over the barrens every third year undoubtedly is a very potent cause of the blueberry being so comparatively free from pests, as many insects must be kept within bounds by this treatment. It may be that advantage can be taken of this method of dealing with the blueberry maggot by burning wider areas if it is found advisable for berry growers to enter into a siege against this insect in the barrens.

It is hoped that when its habits on the barrens have been more thoroughly studied some means of practical treatment may be suggested to help out the situation so that it will not be necessary to shorten the canning season on account of the presence of this insect.

At any rate, the discovery that the apple maggot is also a blueberry pest has widened our knowledge of this insect and may have an indirect bearing on certain infested orchards in the vicinity of scattered blueberry bushes. It throws a decidedly new light on some phases of the apple maggot problem for Maine.

Currant and Gooseberry Aphids.

Every year appeals are sent in to the Maine Agricultural Experiment Station concerning deformed leaves on currant and gooseberry bushes soon after growth starts in the spring. The fresh tender leaves are wrinkled, curled and otherwise stunted and distorted by plantlice that have overwintered on the bushes in the egg stage, thus being ready to attack the new growth as soon as they hatch in the first warm days. As their life histories had not been worked out, during the season of 1913 the Department of Entomology of this Station paid considerable attention to the group of plantlice or aphids that attack the currant and gooseberry. They were found to be particularly difficult to study from the fact that a single collection frequently contained as many as four species with their innumerable progeny harmoniously feeding in mixed colonies on the same stem and leaves. Thus it was no easy matter to isolate the different species for the purpose of rearing the successive generations.

In all, eight species were found to be present in Maine. The worst of these, a grayish species, we have called the "white cornicled currant aphid," on account of the milk white color of the so-called "honey tubes." As these insects reproduce rapidly the colony soon gets too numerous to be sheltered by a single leaf so it scatters to infest the growing shoot and under side of fresh leaves. A thriving colony will distort the stem seriously and cause the misshapen foliage to cluster in a dense protecting mass. It occurs on both currant and gooseberry.

Associated with the species just mentioned is the "green aphid of the gooseberry," a pale aphid taken on wild gooseberry.

A third species common in Maine upon currant in spring is probably the same species as one found on sow thistle and lettuce during the summer. Like many other of the aphids, this insect is migratory and moves to a different sort of vegetation for the summer generations, returning in the fall to the currant to provide for the deposition of the winter eggs.

It is interesting to notice that another currant and gooseberry species is indistinguishable from a lettuce aphid and is probably also a summer migrant to that plant. It is thus apparent that it is advisable to clear out lettuce in the vicinity of this fruit before late summer, care being taken to leave no neglected lettuce stalks about for the development of aphids. This is as much for the sake of the lettuce as the currants for although these green plantlice are not poisonous, most of us prefer our salad served without them.

It is no uncommon thing to find currant leaves puffy with reddish or yellowish blister-like deformations. These are the home of *Myzus ribis,* a delicate little aphid of world wide distribution. Though not so serious a pest as some of the other species, still it is troublesome enough to interfere with the proper functioning of the leaves and, as one currant grower in the state complained, "the plants are hurt and look very annoying." A closely related species which belongs to the same genus and was found present with it on the leaves is an aphid which has not been previously described for the currant.

One of the most interesting of the migratory aphids attacking currant is a species that is found curling the leaves of the English elm in the spring from whence it migrates to currant and gooseberry roots for the summer. As yet this species has not been collected from the bushes in Maine, but as it is present on English elms in this state it doubtless occurs also on currants here as it does in Europe.

These insects, three of which are "new species," are described and figured and pictures of their work are given in Bulletin 225 of the Maine Agricultural Experiment Station.

As most of these aphids are present on the bushes at the time the leaves start in the spring, the logical treatment is to spray thoroughly with tobacco decoction, either home made or some reliable commercial brand, before the leaves become so much distorted that a spray is not practicable. If neglected until the leaves become massed the shoots with the worst infestations may as well be clipped off and burned, and the others thoroughly sprayed.

Poisoned Sweetened Baits and Other Methods of Control of the Currant Fly.

For several years, people in many parts of the state have been digging out their currant and gooseberry bushes because the fruit was so badly infested with maggots that it could not be used. These maggots are the larval stage of a banded winged fruit fly which pupates in the ground over winter and emerges in the spring in time to develop eggs to be deposited in the berries when they are of the right size.

In view of the fact that poisoned sweetened baits have been reported as a successful method of combating certain other closely related fruit flies, the Maine Agricultural Experiment Station secured the services of Doctor H. Severin, a specialist of long experience in this particular line of work, in order to attack the problem of the control of the currant or gooseberry fruit fly with the use of poisoned sweetened baits.

The fact that the egg is deposited within the berry and the maggot does all of its work in the fruit and that the pupal stage is passed under the ground makes it a difficult pest to deal with in these stages. Such remedies have been suggested as picking the entire crop of berries and destroying them before they begin to ripen and before any begin to drop. By thus sacrificing one crop the entire brood of flies would be unable to deposit their eggs and the patch freed from them until they were introduced again from some other source. This method when consistently carried out over a large area for one season ought to reduce the pest to a minimum for years to come. Concerted action of this sort, however, is not an easy matter to bring about and if a direct remedy can be recommended to those who are interested enough in their fruit to take care of it, the present distressing situation will be relieved.

Another treatment which has been suggested is the laborious one of removing about three inches of soil from beneath bushes which had been infested, replacing this with fresh soil, and then treating the infested soil containing the puparia, in such a way that when the flies mature they cannot emerge, or by burying the infested soil deep enough so that the flies cannot emerge, or by depositing the infested soil in a road where the pupæ would be destroyed. At present the destruction of the pupæ in the infested soil by the different methods suggested were put to an experimental test. About a dozen different methods of treating the infested soil without removing it from beneath the bushes were included in the tests made on a farm near Orono.

It has been found that certain other fruit flies, after issuing from the pupæ, require two weeks or more before the egg-laying period begins. This period is a feeding period and during this time the insect flies about seeking food, such as the waxy coating of fruit, juices or injured fruit or infested fallen fruit on the ground, nectar of flowers, moisture on the leaves, etc The greediness of the flies for sweets is a weak point in the life history of these pests and one can readily understand that if this sweet is poisoned and is within easy reach of the flies with their first appearance on the wing, no doubt large numbers would be killed in the two weeks or more before the egg-laying period commences. The problem to be worked out, then, is to ascertain what sweet, cheap enough to be economically available, will attract the currant or gooseberry fruit fly sufficiently to feed upon the poisoned bait.

Comparatively little work with poisoned bait for controlling fruit flies has been done in the United States but in some other parts of the world this method has been in use for several years. In South Africa a decisive demonstration of the success of poisoned diluted molasses to combat the Mediterranean fruit fly was made in the season of 1908-9. "A severe outbreak of this fruit fly in a commercial peach orchard was brought to a sudden and practically complete halt, and the fruit maturing later was marketed under the guarantee of freedom from maggots, while the infestation of the fruit on the control trees increased until practically every fruit was involved."

In controlling the Mexican or Morelos orange worm a common poisonous Mexican herb has been discovered and very satisfactory results from the use of this preparation have been obtained in combating the Mexican fruit fly.

In 1908 the loss to the olive crop of Italy amounted to five million dollars, due to the olive fruit fly. For a period of ten years Italian entomologists have been experimenting with various formulas of poisoned bait to control this pest and at present a cheap and practical remedy has been discovered to combat this fruit fly.

In 1912 similar control measures were adopted against the cherry fruit flies in New York. The fruit of the unsprayed trees showed an infestation of fully one-third of the crop, while only two-tenths per cent was wormy on the treated trees. The sprayed fruit showed also a noticeable lack of curculio injury.

During the past season experiments with poisoned bait were carried on to control the imported onion fly under Wisconsin conditions. The results obtained against the second brood of the pest were most encouraging in a somewhat isolated onion field.

Altogether the evidence in favor of sweetened poisoned baits as a control for fruit flies seemed strong enough to warrant investigations under Maine conditions with this serious pest of the currant and gooseberry.

Sawflies.

Currant "worms" and rose and pear "slugs" are familiar pests wherever these plants are grown. In Maine where conifers abound "worms" with round heads and bodies that jerk into a curl at any disturbance are such frequent devastators of larch, spruce and pine that summer residents as well as owners of forest lands become interested and concerned at their appearance. Related to these commonly known larvæ are many less familiar pests of varying degrees of economic importance, significant enough to deserve serious attention from entomologists.

Realizing that we had very slight acquaintance with the early stages of this family of insects, called sawflies, the Maine Agricultural Experiment Station invited Dr. Alex. D. MacGillivray to spend the summer of 1913 in this state collecting, rearing and studying the larvæ of Maine sawflies. This was in accordance with our present entomological policy of having, when possible, certain groups of economic insects worked up by scientists who have made a specialty along that particular line, the printed results of such study to appear among the papers published by this Station.

Our first contribution on larvæ of sawflies, too technical to be published as a bulletin for general distribution, appeared in the Forty-Fourth Annual Report of the Entomological Society of Ontario, the substance of the paper having been delivered before that society by Doctor MacGillivray after his summer's work in Maine. The following paragraphs are for the most part adapted from his contribution.

A sawfly belongs to the same order of insects as the bees and wasps but instead of having a sting for an ovipositor, its egg laying apparatus is equipped with a small saw with which it cuts a slit in the tissue of the plant and deposits an egg in the opening. The adult or winged sawfly does practically no harm, but the young which hatch from her eggs are as greedy as caterpillars and as completely demolish the foliage they feed upon. These larvæ resemble hairless caterpillars somewhat in their appearance as well as in their feeding habits and are frequently mistaken for them.

The eggs are always laid by the female within the tissue of the food plant. Where the larvæ are borers, they are laid in holes pierced in the stems of bushy plants or in the limbs or trunks of living or recently dead trees. Where the larvæ are leaf-feeders, the eggs are placed in slits sawed by the female from the under surface and located between the two layers of parenchyma. A few species insert their eggs in the petiole of the leaf, some of the gall-making species in the leaf-buds, and one in the blossoms of cherry on the sepals or the upper part of the calyx cup. The eggs are oval in outline, flattened, usually white in color, though sometimes bluish or greenish, and very difficult to locate when first laid. They swell after a short time to twice their original size and push out the surface of the leaf so that it appears to be covered with little mounds.

The manner of feeding is strikingly varied. With many species, the young larvæ as soon as they emerge from the egg, eat holes through the leaf and continue feeding around the circumference of the hole, clinging to the leaf with their thoracic legs and holding the body S-shaped in the hole. Some species are leaf-skeletonizers for the first two or more stages and then either feed from the edge or eat holes in the leaf. The great majority of species are edge feeders.

The larvæ of certain genera and subfamilies of the sawflies are entirely different in appearance during their last larval period; white larvæ may become spotted, the spotted change to white or green and the spiny lose their spines. Thus the same specimen may be powdery white one afternoon and the next morning yellow with black spots. These changes which take place at time of molting increase the difficulties of studying a species.

The members of one subfamily feed on various species of conifers; they clasp the needles between the thoracic legs and feed until only short stubs are left. Some species will feed on the needles of the year old growth, others are indiscriminate, feeding either on the new or the old growth. The pines, spruces, and larches especially suffer from the attack of sawfly larvæ in Maine and on this group of larvæ Doctor MacGillivray has in preparation a bulletin to be published by this Station.

Powdery Scab of Potatoes.

For many years the plant pathologist of the Maine Agricultural Experiment Station has been studying the common scab of the potato, and in this connection has asked for specimens of scab to be forwarded in different years from various parts of the country. About two years ago two specimens were received—one from Massachusetts and the other from Nebraska—which were infected with powdery scab. So far as is known, this was the first intimation of any powdery scab produced on potatoes grown within the United States.

Some six months before the first specimens of powdery scab were discovered in Maine, and over a year before it was known that the disease occurred in the state except on one or two farms, this Station issued a warning as to the dangerous nature of the disease, described its appearance, pointed out the strong possibility of its being introduced into the state on account of its presence in Canada, and requested potato growers and others to coöperate, as it has done at various times in the past, by sending in suspected specimens in order that the presence and distribution of this and other dangerous plant diseases might be known as soon as possible.

Powdery scab differs from the ordinary scab, which is well-known practically everywhere that potatoes are grown, in quite a number of ways. The common scab is caused by a minute fungus; the powdery scab by an organism of larger size and belonging to a different order of plants called slime moulds. Common scab produces relatively large, more or less irregular brownish spots, usually with a decidedly uneven surface. Powdery scab forms only small spots which are at first in the form of pustules containing a brownish or olive colored powder. Later the tops of these pustules become rubbed off, leaving small, scab-like spots. These may run together into larger patches but even then the original limits of the spots or pustules can usually be made out.

A very important difference between common and powdery scab is that the former produces only one type of injury to the potato tuber. In addition to the ordinary type, powdery scab in severe cases may produce true cankered areas where the tissues are eaten into and hollowed out. Also in severe cases of the ordinary, pustular or scabby stage of the disease, potatoes attacked by powdery scab exhibit a strong tendency to wither and dry out and show an apparent dry rot.

Methods of Control.

When it became evident that powdery scab was prevalent in at least limited sections of the state, the Station pathologists were at once delegated to assist the state and national authorities in making a preliminary survey to determine the limits of the infected areas. One of the pathologists also spent some time in assisting in training the inspectors when the state inaugurated its inspection service. A bulletin has been published which summarized the information regarding the disease to date, and studies are now being carried on with reference to control measures and life-history studies. The following are some of the control measures advocated in order to prevent the spread and distribution not only of powdery scab, but of several other important tuber-borne diseases as well:

Use for seed only stock that is known to be free from contamination with powdery scab. Remove all tubers which are bruised, cracked or show evidence of decay or disease of any kind. Soak this sorted and selected seed for two hours in a solution of one pint of 40 per cent formaldehyde in 30 gallons of water, or one and one-half hours in a solution consisting of four ounces of corrosive sublimate in 30 gallons of water. Have two or three knives for each cutter and when not in use immerse the blades in a strong solution of formaldehyde. When cutting seed reject every tuber which shows any discoloration of the interior. At once drop the knife used in cutting the discolored tuber into the strong formaldehyde and use one of the other knives until another suspicious potato is cut. Use care that the disinfected seed does not come in contact with barrels, baskets, planters, etc., which have been used for diseased seed.

It is recommended that seed tubers be thoroughly dusted with sulphur as soon as they are cut, or before the surfaces have become dry.

No exact data are available as to how long the germs of powdery scab remain in the soil after once introduced, but the Station has secured information that indicates that this is a matter of several years, at least. Hence, land known to be infected should be kept in other crops as long as possible. If the infected area is large it would be best to test a small patch in the worst infected section by first planting it with clean, disinfected seed a year in advance before risking the chance of loss of seed and crop on the whole field.

Methods of Disinfection.

Many inquiries have been addressed to the Station asking for information as to the best methods for disinfecting potato storage houses, implements or containers which may have become contaminated with the germs of powdery scab. The notion that the disease may be spread by means of articles which have come in contact with affected potatoes appears to be well founded. No doubt, if it could be traced, it would be found that some of the powdery scab in Maine came from the purchase of second-hand sacks previously used for imported potatoes. Likewise it is evident that only a relatively few barrels of affected tubers in a storage bin might so infect the bin and other parts of the house as to result in spreading the disease in a manner far out of proportion to their number.

Assuming that only healthy, disinfected seed is used and planted on clean soil, how may it and the resulting crop be protected from infected barrels, sacks, planters, potato houses, etc.? From an experimental standpoint very little has been done as yet to answer this question and some phases of it have not been touched at all. However, there is available a large amount of data regarding the effect of certain fungicides and germicides upon the organisms causing common scab, blackleg, the Rhizoctonia disease, etc.

Planters and other tools which have in any way come in contact with the germs of powdery scab should be washed clean, then thoroughly washed or sprayed with a strong solution of formaldehyde, one pint to five gallons, and allowed to stand a few days before using. Barrels or other containers may be handled in the same way. Sacks may be disinfected by soaking two hours in formaldehyde the same strength as used for treating seed potatoes, one pint to 30 gallons of water, and then drying. Doubtless a less expensive method for disinfecting sacks would be steam sterilization at some central station.

Corrosive sublimate and copper sulphate solutions have both been recommended for disinfecting tools and implements. These are undoubtedly as efficient for the purpose as formaldehyde and are all right from the standpoint of the scientist, but the practical farmer may experience difficulties with them, especially with corrosive sublimate, which will not make him kindly disposed toward them. Corrosive sublimate produces a very active, corrosive action upon metals, especially upon iron—it being necessary to always use wooden tubs or vessels for containers in disinfecting seed tubers. Therefore, it is not adapted for and never should be used upon the metal parts of good tools or valuable farm machinery. While copper sulphate solution acts upon iron this action is much less severe than is the case with corrosive sublimate. Hence there is much less objection to the use of copper sulphate solution. Formaldehyde solution, on the other hand, when used as recommended, produces no more injury to the tools than so much water.

Special attention should be given to empty storage houses. All loose dirt and rubbish, including decayed potatoes or other culls, should be removed from the interior and from around the outside of the house. As much of this material as possible should be burned. What remains unburned should be soaked with a strong solution of copper sulphate. After all rubbish has been removed the interior walls and floors of the empty potato house should be thoroughly sprayed with a solution of copper sulphate, 5 pounds and water 50 gallons. The addition of a small amount of lime will aid in marking the portions covered by the spray. A hand barrel-pump with 25 to 50 feet of hose with an extension rod such as is used in orchard spraying is very satisfactory for this purpose.

More complete disinfection of empty houses may be secured by the use of formaldehyde gas *following* spraying with copper sulphate. To accomplish this, make all outside doors and windows as tight as possible. For every 1000 cubic feet of contents of the house or room use 23 ounces of potassium permanganate and three pints of 40 per cent formaldehyde. Spread the permanganate evenly over the bottom of one or more large vessels like a wash tub or half of a kerosene barrel, these latter arranged in the central parts of the floors of the house or rooms. Pour the formaldehyde quickly over the permanganate, being sure that it is well mixed with the latter. Leave and tightly close the house at once. Allow to remain closed 24 hours or longer. Barrels and tools if clean, can be disinfected at the same time, although probably not so thoroughly and efficiently as by washing with formaldehyde solution. Do not attempt to use the gas in the house till after all potatoes and rubbish have been removed and the house cleaned up as described above.

Sulphur and Common Potato Scab.

The pathologists of the Station have recently been giving considerable attention to the subject of soil disinfectants, particularly sulphur, for use upon land infected with common scab, powdery scab, and the Rhizoctonia disease of potatoes. While little hope was entertained that a satisfactory material could be found which would be sufficiently cheap in price to allow its use in the necessary quantities to ensure success, the question is of so much importance to the potato growers that any possibility of success, no matter how remote, should not be overlooked.

The fungicidal properties of sulphur are well known. Moreover, the chemical compounds which would be formed as the result of the addition of sulphur would tend to develop acidity in the soil which of itself is unfavorable to the common potato scab organism. Experiments conducted in New Jersey some years ago indicated that it was of value, at least under some conditions, as a soil disinfectant for common scab. It can be purchased in ton or carload lots at a considerable less price than the same amount of fertilizer. Therefore it seemed to be a favorable material with which to experiment.

The present discussion is limited to the use of sulphur on soil contaminated with the germs of the common scab and is not concerned with the use of sulphur for other soil-inhabiting potato diseases. Certain greenhouse experiments, although necessarily conducted on a small scale, gave some rather interesting results. Sulphur was added to 10-inch pots of greenhouse soil, well contaminated with scab germs, at the rate of 300 pounds per surface acre. This was mixed only with the soil immediately surrounding the seed tuber, simulating as far as possible the application in the hill by means of a planter. Some of the pots of soil were sterilized to make them comparable to clean land. Scabby seed tubers were planted in this, with and without sulphur. At the same time disinfected and undisinfected scabby seed tubers were planted in other pots of unsterilized soil, with and without sulphur.

When the seed was scabby, the soil not sterilized, and no sulphur was used, 100 per cent of the crop was scabby. The addition of sulphur in the manner described reduced the amount of scab but slightly. Sterilized soil and scabby seed gave 30 per cent of scab on the crop, while perfectly clean potatoes were secured with the same sterilized soil and scabby seed where sulphur at the rate of 300 pounds per acre was mixed with the soil immediately surrounding the seed-piece. Apparently this amount of sulphur was sufficient, when applied in this manner, to prevent the disease from spreading from the infected seed-piece to the crop, but not enough to materially reduce it where the soil itself was badly contaminated with the germs of the disease.

Some pots of fresh greenhouse soil were planted with scabby seed tubers, disinfected with formaldehyde, with and without the addition of sulphur to the pots. In this case there was an average of more scab where the sulphur was used than without.

A reasonable explanation of the failure of sulphur to produce results in this instance, and also in the unsterilized pots of soil mentioned above, comes from the fact that the scabby tubers were found in those parts of the pots outside of the area of soil into which the sulphur was introduced.

The chief value of these greenhouse experiments lies in the fact that they were carried out under control conditions—they are far too limited to admit of any definite conclusions. They do, however, suggest certain things of practical interest, the most important one of which comes from the results obtained where sulphur was used with scabby seed on clean or sterilized soil. This is, that the practice recently adopted by some of our potato growers of dusting cut seed with, or rolling it in, sulphur, is a good one and should be encouraged. If the seed tubers are first carefully sorted, then disinfected with corrosive sublimate or formaldehyde, cut and dusted with or rolled in sulphur, it would seem as if the danger from the introduction of common scab into clean land by means of seed tubers would be practically eliminated.

A close analysis of the results of these greenhouse experiments does not tend to encourage the view that sulphur can be used economically to rid badly infested soils of the germs of common potato scab. However, in this and in most other experiments no account of the later effects of sulphur in the soil are taken into consideration and it hardly seems possible that the entire effects are obtained the first year. Hence the case may not be entirely hopeless.

Field experiments designed to test matters of this kind are not easy to perform, as it is next to impossible to get any large body of land equally infected and alike in all other particulars. An attempt was made to carry on such an experiment in coöperation with an Aroostook county potato grower last season. Seven half-acre plots were laid off on one side of a large field where the land was said to be fairly uniformly infected with common potato scab. A plot of Green Mountains and one of Irish Cobblers were treated at the rate of 1000 pounds of sulphur per acre, harrowed in before planting. These were followed by an untreated check plot of equal size and this by plots of Cobblers, side by side with untreated checks, where 500 and 300 pounds of sulphur were added respectively.

Several factors intervened which influenced the accuracy of the results, but so far as could be judged, the application of 300 pounds of sulphur to this land produced no appreciable effects in reducing common scab the present season. The potatoes from this plot were equally badly incrusted with scab spots as those produced upon the adjoining checks—practically all of them being unsalable except for starch making. Where 500 pounds of sulphur was used there were fewer tubers thoroughly covered with scabs and a small per cent of the crop here was merchantable. Where 1000 pounds of sulphur was applied per acre, fully 75 per cent of the crop was suitable for table purposes and it was estimated that at least one-third of these were free from scab.

Based upon the figures alone, it would seem that the larger amount of sulphur materially reduced the amount of scab on the crop for the current year. There is always the possibility that on large plots of land like these the soil is unequally infected or some outside factor interferes. However, the check alongside of these plots which received the heaviest application of sulphur produced fully as much scab on the crop as on any other part of the field. Before the plots were planted a record was made of the fact that the owner of the land stated that according to his best recollection the soil where the heavier amounts of sulphur were applied was, if anything, the most seriously infected of any on the field. He was not so positive of this fact after the results were obtained at digging time, thus leaving this question somewhat in doubt.

The following paragraph quoted from a recent publication of the Cornell Experiment Station is a brief summary of some quite extended experiments made at that institution along the lines under consideration.

"From our work on sulfur treatment of soil against potato scab it is evident that by application of sulfur in sufficient quantity—450 to 900 pounds per acre—if the application is made broadcast and the sulfur is thoroughly mixed with about two inches of the surface soil just before the potatoes are planted, the amount of scab can be considerably reduced, especially by the heavier application of sulfur. * * * In no case, however, even by the heaviest of the tested applications of sulfur, was the scab entirely eliminated."

Apple Spraying Experiments at Highmoor Farm.

The season of 1914 marked the completion of the fifth year of a series of apple spraying experiments carried on by the Station at Highmoor Farm, the object in view being to improve methods and mixtures in order to secure more efficient control of apple scab and other orchard diseases without adding to the expense involved. Some very important and suggestive practical results have already been obtained, particularly during the past three years.

One of the most striking results and to a certain extent an unexpected result of the two previous seasons was the discovery of the relatively high efficiency of arsenate of lead as a fungicide when applied slightly in excess of the amount commonly used as an insecticide. As yet an opportunity has not presented itself where it has been possible to test the effect of arsenate of lead alone under exceptionally severe conditions. Hence, a plot sprayed with this without the addition of any other fungicide was included last season and will be repeated each year till a season occurs where the weather conditions are exceptionally favorable to scab development.

Arsenate of lead is well and favorably known and widely used for spraying apple trees as an insecticide in combating codling and brown-tail moths and kindred pests of the orchard. In recent years it has been known to have some fungicidal value, but apparently no one has considered this to be of much importance for when used in connection with bordeaux mixture, lime-sulphur, or other recognized fungicides in spraying experiments, it has been customary to assign to the latter all beneficial results secured in the control of parasitic fungi. Hence, the observations made at Highmoor Farm with regard to the fungicidal value of arsenate of lead may be looked upon as discoveries of considerable practical value.

In 1912, a plot of trees sprayed only with arsenate of lead at the rate of four pounds of the paste form to 50 gallons of water showed better scab control than where standard dilution lime-sulphur and two pounds of arsenate of lead paste has been applied and even better than where bordeaux mixture and the smaller amount of the insecticide was used. No unsprayed check plot was available that year.

In 1913, an unsprayed check plot was added and powdered, dry arsenate of lead substituted for the paste. Two plots were sprayed with arsenate of lead alone, one with two and another with one pound of the powder to 50 gallons of water or equivalent to about four and two pounds of the paste form, respectively. Nearly 39 per cent of the apples on the unsprayed plot were scabby. Almost perfect scab control was secured with bordeaux mixture, lime-sulphur and the larger amount of arsenate of lead used alone—the efficiency being in the order named. Attention should be called to the fact that one pound of dry arsenate of lead was added to each 50 gallons of the bordeaux mixture and lime-sulphur, also that where this smaller amount of arsenate of lead was used alone the amount of scab was reduced from nearly 39 per cent to less than 16 per cent. Hence, it is more than a possibility that when the insecticide is added to bordeaux mixture or lime-sulphur, it may contribute materially to the fungicidal effect of the combined spray.

In 1913 there was considerable russeting of the fruit. Much of this as indicated by the condition of the apples on the unsprayed check plot was due to natural conditions, but this russeting was largely increased by the action of some of the sprays. This increase of russeting on the lime-sulphur and bordeaux plots was about 11 and 40 per cent, respectively, while, where the two pounds of dry arsenate of lead was used alone in 50 gallons of water, it was actually less than on the check plot.

The results secured in 1912 and 1913 were sufficiently encouraging to warrant a repetition of this part of the experiment, but omitting the smaller amount of arsenate of lead used alone. Also the results of the previous season suggested the alluring possibility that, except for the "pink spray," arsenate of lead used somewhat in excess of the usual amounts might be depended upon to prevent apple scab as well as control certain of the more important insect enemies of the orchard, thus eliminating a considerable part of the labor and expense of orchard spraying.

Accordingly, in 1914, in addition to spraying a plot with arsenate of lead alone, used at the rate of two pounds of the dry powder to 50 gallons of water, one plot was sprayed the first time with a 3-3-50 bordeaux mixture, plus one pound of the dry lead arsenate and later with two pounds of the arsenate alone in 50 gallons of water. On another plot lime-sulphur, 20 per cent stronger than standard dilution, was used in place of bordeaux mixture at the first application. These and all other plots in the same experiments were all sprayed on the same days, first on May 23 when the flower buds were showing pink, second June 6, just after the petals fell, and again on June 22. Those mentioned above were compared with adjoining plots sprayed with bordeaux mixture, standard strength lime-sulphur and lime-sulphur 20 per cent stronger than standard, to which, in each case, one pound of dry arsenate of lead had been added to every 50 gallons of spray. An unsprayed check plot was also saved.

The season of 1914 was somewhat peculiar with reference to scab development and control. The disease was not particularly severe at Highmoor Farm, even on unsprayed trees, and the results secured from treatment with standard sprays were rather erratic. However, nothing occurred to materially change the tentative conclusions derived from the work of the two previous years regarding the fungicidal value of arsenate of lead, although its relative efficiency in 1914 was considerably less than before. When lime-sulphur 20 per cent stronger than standard dilution plus one pound of dry arsenate of lead was used for the first spraying and two pounds of the arsenical was used alone for the later applications, 96 per cent of perfect apples were obtained as compared with less than 94 per cent where standard dilution of lime-sulphur was used in combination with the smaller amount of the insecticide for all three applications. Scab control was slightly better on the last mentioned plot, but there was decidedly more russeting of the fruit, thus decreasing the percentage of perfect apples.

A rather surprising result was obtained where bordeaux mixture was used for the first spray, even though it was applied before the blossoms opened. Over 15 per cent of the fruit was russeted as compared with less than two-tenths of one per cent on the unsprayed check plot. This could not be attributed to the later applications of arsenate of lead for, on this plot where all three applications consisted of the stronger amount of this material alone, only a little over one per cent of the fruit was russeted.

Substitutes for Lime-Sulphur Sprays.

A spray combination known as "copper-lime-sulphur" has been tried and recommended by the Virginia Experiment Station as efficient in controlling rust on apples. A plot of trees sprayed with this material was included in the 1914 experiments to see if it would prove equally satisfactory for preventing apple scab in Maine. The results obtained on Ben Davis trees were very disappointing. The trees suffered severely from foliage injury. Over 57 per cent of the fruit was russeted and less than 41 per cent of perfect apples were obtained, while adjoining plots sprayed with other fungicides produced from 96 to 98 per cent of fruit without spot or blemish.

On account of real or supposed difficulties attendant upon the manufacture of concentrated lime-sulphur solution at home it has come to be the common practice in Maine to purchase the material already prepared. Except for the added cost there is no particular objection to this for, unlike the numerous forms of ready-made bordeaux mixture which have appeared from time to time, the various brands of concentrated lime-sulphur put out by reliable concerns appear to be equal to the best of the home-made goods. However, every time an orchardist purchases rather than makes his lime-sulphur concentrate he pays freight from Boston, New York, Baltimore or some other more distant point upon from one-fortieth to one-tenth of all the water used in his spray. In the case of a large orchard this is an item of expense of considerable importance.

From the above it is apparent that any concern which can place on the market a lime-sulphur concentrate with all the water removed, or can furnish some other form of dry powder or paste which is equally as satisfactory as a fungicide, will thereby secure a distinct advantage over its competitors. The first proposition so far has not proved practicable but there are powder and paste substitutes on the market. It is not the practice of nor within the province of the Station to conduct tests of proprietary articles of this nature, but on account of the distinct advantages which these concentrated spray materials appeared to offer, provided they could substantiate the claims which their manufacturers made for them, it seemed advisable to include some of them in the spraying experiments conducted at Highmoor Farm in 1913 and 1914.

In 1913 two different brands were used. One of these was in the form of a moist paste and apparently had a large amount of very finely divided sulphur, but gave off a distinct odor of hydrogen sulphide, resembling the smell of stale eggs. The other consisted of a dry, yellowish powder which appears to be largely sodium sulphide. While the manufacturers made no statements in the literature which they sent out, claiming that such was the case, many of the purchasers of this latter compound in Maine in 1913 supposed that it was identical with lime-sulphur solution with the water removed.

The paste was used at the rate of seven pounds to 50 gallons of water and the powder at the rate of two pounds to 50 gallons. One pound of dry arsenate of lead was also added to control insect pests. Three applications were made—one just as the blossoms were showing pink, one after the petals fell, and another about three weeks later.

The plot sprayed with the fine sulphur paste showed no foliage injury and scab was well controlled on the leaves throughout the season. On the other hand, while the powdered material was efficient in controlling scab it produced, when used as above described in combination with the arsenate of lead, very decided injury to the foliage. This began to appear shortly after June 3 when the second application of the spray was made, and consisted of a spotting and more or less browning of the margins of the leaves. After the third application this injury developed quite rapidly and by July 7 from 75 to 90 per cent of the leaves were affected. This was followed by much yellowing and leaf fall, resulting in quite marked defoliation of the trees.

The results obtained at harvest time when the percentages of scabby and perfect apples produced on the different plots were determined confirmed the observations made in the summer with reference to the control of the disease on the leaves. Both of the proprietary compounds produced as high or nearly as high percentages of apples free from scab as was obtained where standard dilution lime-sulphur was used.

In 1914 these experiments were repeated and another possible substitute for lime-sulphur was added to the list. This latter was simply a very finely divided sulphur, much finer than the ordinary flour sulphur of commerce. The chief difficulty encountered in attempting to use pure sulphur in a spray is that it cannot be wet readily and consequently refuses to stay in suspension. This was overcome with the fine sulphur by first wetting it with a small amount of dilute glue solution. It would then stay in suspension long enough to be applied to the trees.

Again, extremely satisfactory results with reference to scab control on both foliage and fruit was obtained with the paste and powder used the season before, but the latter in combination with the usual amount of arsenate of lead, although reduced three-fourths pound to 50 gallons of water on the recommendation of the New England selling agents of the compound, caused fully as much defoliation as the previous season. This year leaf injury was noted even before June 6, the date of the second application of the spray. Defoliation began soon after this and in ten days, from one-third to one-half of the surface of the ground under the trees was covered with fallen leaves. By the last of June fully one-third of the leaves had fallen from the trees sprayed with this material.

No spray injury was observed throughout the season, but some scab developed on the leaves of the trees which were sprayed with the extra fine sulphur. It did not control scab so well on the fruit as did standard dilution lime-sulphur or the two compounds already mentioned, but showed enough fungicidal value to warrant a repetition of the experiment.

Annual Exhibition Maine State Pomological Society, Bangor, Nov. 17-19, 1915, looking up City Hall, with jelly and preserve exhibit in extreme end.

ANNUAL REPORT

OF THE

State Pomological Society

1914

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Vice-Presidents.

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Geo. A. Yeaton,	Norway

Secretary.

E. L. White,	Bowdoinham

Treasurer.

T. E. Chase,	Buckfield

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E. F. Hitchings,	Orono
H. L. Keyser,	Greene

Members Experiment Station Council.

Howard L. Keyser,	Greene

Vice-President N. E. Fruit Show.

Homer N. Chase,	Auburn

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Hancock County—C. L. Morang,	Ellsworth
Kennebec County—Clement & Taylor,	Winthrop
Knox County—Fred A. Gleason,	Union
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Waldo County—Harry W. Littlefield,	Brooks
Washington County—David Campbell,	Cherryfield
York County—C. E. Felch,	Limerick

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MEMBERS OF THE SOCIETY.

LIFE MEMBERS.

Allen, W. H.................Buckfield
Andrews, Charles E..............Auburn
Atherton, Wm. P..............Hallowell
Atkins, Charles G.............Bucksport
Averill, David C..............Temple
Bailey, W. G..................Freeport
Bennoch, John E...............Orono
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Bisbee, Stanley............Rumford Falls
Blaisdell, A. L..............Winterport
Blossom, O. E.............Turner Center
Briggs, John......................Turner
Burleigh, Miss Clara M........Vassalboro
Burr, John.....................Freeport
Butler, Charles M..............Wiscasset
Butler, Alonzo...................Union
Butnam, J. W..................Readfield
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Chase, Homer N..................Auburn
Chase, Thomas E...............Buckfield
Clement & Taylor...............Winthrop
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Conant, E. E.....................Hebron
Conant, Geo. I...................Hebron
Conant, H. L...........Hebron Station
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Crowell, John H..............Farmington
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Emerson, Charles L.........South Turner
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French, H. C...............Rumford Center
Frost, Oscar F.................Monmouth
Gardiner, Robert H.............Gardiner
George, C. H......................Hebron
Goddard, Lewis C..............Woodfords
Grover, Franklin D.................Bean
Gulley, Alfred G............Storrs, Conn.
Hackett, E. C...........West Gloucester
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Hardy, Walter M...................Brewer
Hayes, William..................Gardiner
Heald, U. H.........................Paris
Herrick, A. A.....................Norway
Hitchings, E. F....................Orono
Hoyt, Mrs. Francis..............Winthrop
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Keyser, Howard L..................Greene
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Lapham, E. A.....................Pittston
Leavitt, L. C..................Kezar Falls
Lee, Lyman K....................Foxcroft
Leland, Will E............East Sangerville
Lincoln, E. L......................Wayne
Litchfield, J. H...................Auburn
Littlefield, Harry W..............Brooks
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Merrill, Rupert B...............Gardiner
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Mitchell & Co..................Waterville
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Page, F. W.......................Augusta
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Pope, Charles S................Manchester
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Ricker, Fred P.....................Turner
Roak, George M....................Auburn
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Rogers, Mrs. Jeanette....North Newburgh
Sawyer, Andrew S..........Cape Elizabeth
Saunders, Ernest.................Lewiston
Seavey, Mrs. G. M.................Auburn
Simmons, H. J. A.................Waldoboro
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Walker, Elmer V....................Oxford

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Weston, Joseph................ Gardiner
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White, Mrs. Annie.......... Bowdoinham
White, Edward L........... Bowdoinham
Whitman, L. E................ Hebron
Woods, Charles D................ Orono
Wright, Frederick................ Bath
Yeaton, George A............ Augusta
Yeaton, Samuel F..... West Farmington

ANNUAL MEMBERS FOR 1914.

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Bartlett, E. W.............. Pittsfield
Bass, Lizzie E.................. Wilton
Bass, Mary A.................. Wilton
Beal, F. O..................... Bangor
Bean, George............... West Minot
Bearce, H. W................. Hebron
Blaisdell, A. L............. Winterport
Blanchard, Cliff............ Farmington
Bordon, F. F................ Brooks
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Cameron, Mrs. Harry............ Union
Campbell, David W......... Cherryfield
Carll, E. C.................. Augusta
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Cleaves, William W.... West Sangerville
Clements, Charles E....... Winterport
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Conant, W. H.............. Buckfield
Cressey, E. B................ Standish
Deering, A. L................ Augusta
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Kimball, F. H............... Waterboro
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McIntire, M. H.............. Berwick
Miller, W. C., 15 Main St....... Bangor
Milliken, E. C................ Portland
Morse, Lawrence C........... Buckfield
Paine, C. D..................... Dover
Pease, C. M..................... Anson
Penney, C. L........... Mechanic Falls
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Shaw, Ralph W. E.......... Sebago Lake
Sturtevant, Ernest F., 95 Park Ave. Auburn
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Tainter, Albert W.............. Dixfield
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Varney, Clark E............ Kezar Falls
Verbeck, R. H.............. Kezar Falls
Vigue, C. H., 15 Silver St...... Waterville
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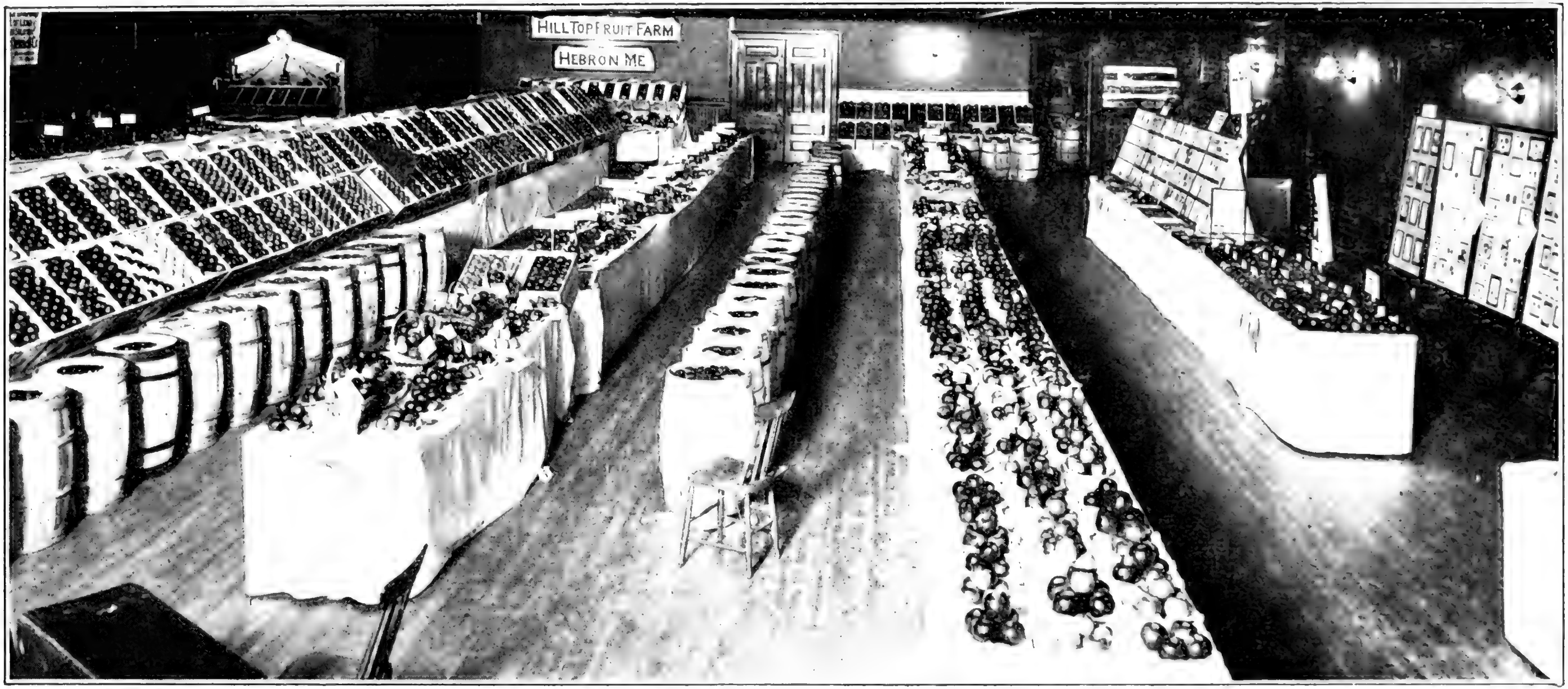
Waterhouse, W. H............ Old Town
Wyman, P. M.............. West Paris
Yeaton, George A............. Norway
York, George H., R. F. D. 3...... Monroe



Annual Exhibition Maine State Pomological Society, Bangor, Nov. 17-19, 1915, looking down the right side of City Hall.

ANNUAL MEETING
OF
MAINE STATE POMOLOGICAL SOCIETY

BANGOR, NOV. 17, 18 AND 19, 1914.

TUESDAY EVENING, NOVEMBER 17.

Music. Prayer. Music.

ADDRESS OF WELCOME.

HON. J. G. UTTERBACK, Mayor of Bangor.

Mr. President, Ladies and Gentlemen:

It is indeed a pleasure to greet you and to extend to you on behalf of the citizens of Bangor and the Bangor Chamber of Commerce a hearty welcome to our city. It has been, and shall be, our earnest endeavor so to play the part of host that you will all carry with you a pleasant recollection of your visit in Bangor.

We of Bangor believe that Bangor is the logical convention city of the State of Maine, situated as we are in the center of the state, and being near the center of population, possessed of the very best hotels in the state and also of the very best of shopping facilities. We are glad to have you with us. A convention of this sort, bringing to us the representative people of the various sections of the state, is certainly an inspiration to all of us, and we in Bangor benefit, and we believe that you derive on your part a benefit, particularly from the coöperation and intermingling of ideas. Certainly every one who in any way takes part in a gathering of this sort derives a benefit. And I am sure that every one present tonight, particularly those who come without any real idea as to the nature, or rather as to the extent, of this exhibit, is certainly delighted beyond measure to know that the state of Maine can produce an exhibit of this sort. A very short time ago I was talking with a gentleman who has been a member of the Western New York

Fruit Growers' Association, an association comprising over 1,400 members. This gentleman has attended many of their exhibits in Rochester and he says that never at any exhibit there has been seen such a splendid display of fruit as he sees here tonight.

I believe firmly in the future growth and development of the State of Maine. I believe that there is no state in the Union today making more rapid progress in commercial, industrial and agricultural lines than in Maine. But in order to promote this advancement in which we are all so interested, we need more coöperation on the part of all of us. Surely we cannot accomplish things unless we all get together with the firm determination of making Maine stand where she should.

Now the Bangor Chamber of Commerce has a slogan, and it is "Boom Maine by eating Maine apples." That is a splendid slogan, and particularly so to the State Pomological Society, and I believe it is one that should be carried further than this convention.

We are glad to have you here with us. We hope that your deliberations will be beneficial, and that you will carry away with you a pleasing impression of Bangor.

RESPONSE.

By Dr. Leon S. Merrill, University of Maine.

Mr. President, Ladies and Gentlemen:

I do not know that I ever approached a duty with greater embarrassment than the present one,—first, because this is one of the occasions when a man ought to be able to say just the right thing; second, because of lack of sufficient time to prepare myself for the task; third, because to properly express our appreciation for the happy circumstances surrounding this occasion is difficult. But we sincerely hope, Mr. Mayor, that the program we have prepared, and this splendid exhibit of the fruits of the farms of Maine now displayed before us, and the general manifestation of pleasure and happiness by those in attendance, will convey to you and to the gentlemen of the Chamber of Commerce in terms far more definite and emphatic than any which I may give expression to, our appreciation of your interest in the industry we represent, the assistance you have given to make this meeting a success, and the plans you have made for our happiness and comfort during our stay in Bangor. It is always pleasant to be assured that you are welcome, and the words of his Honor, the Mayor, leave no chance for us to doubt that we are among friends. All this gives us a feeling of comfort and content, and we are now prepared under these very favorable circumstances to proceed with the business of this meeting.

It would, I think, be out of place for me to attempt any extended address. Hence my remarks will be confined to a very brief and general statement concerning the Pomological Society and its function, and its relation to the agriculture of the state. With the exception of the Grange, I think the Pomological Society is the oldest and largest farmers' organization in our state. Its function is the development of the fruit industry of Maine. It does this by means of its annual exhibits and its educational and promotion programs. It also takes an active interest in the protection of the industry and it has had no small share in shaping and securing the legislative acts now upon our statute books concerning the fruit industry. I think it can be truly said that the Pomological Society is one of the most influential factors in Maine agriculture today, that it is aggressive and progressive in its efforts to secure every improvement to the agricultural interests of Maine. It is always supporting every move that is likely to bring about encouragement and improvement in our agricultural interests. I think it would need but just a glance about this hall tonight to convince you that the fruit industries of Maine, at least, are developing. Maine has already approximately forty-two per cent of all the apple trees of bearing age in New England, and at least fifty per cent of all the trees of non-bearing age. Maine can therefore well claim to be the leading fruit growing state of the northeast group of states. She has large areas of soil well adapted to fruit growing. It is unnecessary for me to enlarge upon this fact or to explain the reasons therefor, since they are quite generally known to Maine people and therefore need no elaboration. That this adaptation is being taken advantage of more and more each year is a source of pride to this association. We are glad to see the development of the fruit industry go on, because of its effect upon the agriculture of the state and upon the men and the women who are engaged in fruit-growing. My appreciation and my understanding of the fruit grower has considerably enlarged during the past few years and I have come to look upon him as a tremendously important factor in the development of the agricultural interests of our state. I would like to bring perhaps more definitely from my notes than I could speaking extemporaneously, my impression of the modern fruit grower.

The modern fruit grower is progressive. He adopts new ideals readily. He keeps in touch with the results of experiments conducted by the experiment stations, and therefore with the up-to-date methods in fruit growing. He tests out the new ideas on his own farm, and his knowledge and understanding of the business enlarges correspondingly. The artistic temperament of the farmer is developed and along with it his appreciation of all that is best in all kinds and types of farms. The reaction of fruit growing upon the farmer is therefore to make him studious, thoughtful, appreciative and progressive, and these qualities are reflected in his attitude toward education, and especially toward agricultural education, toward scientific investigation, business organization and management of the farm, improved roads, co-operative buying and selling associations, and community spirit and pride. The reaction upon agriculture generally is educational, inspiring and elevating.

But, my friends, the growing of fruit in abundance is not enough to secure agricultural prosperity. The elimination of waste in the production of fruit and the constant improvement in quality even are not enough to guarantee a living profit to the fruit-grower. Fruit once grown has to be sold. To do this requires some machinery of distribution. And somehow that machinery of distribution appears to most of us to be complex, and at some points wasteful and even extravagant in operation. It is well to note that this machinery is not operated by the man who grows the fruit or by the person who consumes it. It is, on the other hand, controlled by that person who has no other interest in the industry except to take a price at every turn of every wheel in the machinery of distribution. This fact is now pretty well known. And I think it is only fair to state that the distributor, or at least some distributors at some points in the machinery of distribution, stand today indicted before the bar of public opinion with the offence of wasteful methods in distribution and exorbitant profits. Some of us feel that business men and business men's organizations might help this situation. If not, then the farmer must organize his own machinery of distribution for the handling of this important product of the farm. And it is a source of congratulation to the farmers of Maine that this movement has begun. It was a very happy thought last year, my friends, when the members of this society elected as its president, the president of the first fruit growers' association in Maine engaged in the business of distributing their own product. We are looking very hopefully to that association and to others that have been organized since. In closing, I will say that we certainly appreciate the courtesies already extended and the plans that have been made for our comfort during the few days we shall remain in this city as her guests, and I hope that the effect of this meeting upon the fruit industry of this section of the state will be immediate, helpful and lasting.

OUR FRIENDS THE BIRDS.

Dr. Edward Howe Forbush, State Ornithologist, Boston, Mass.

(Illustrated Lecture.)

Recent agitation for the protection of birds has resulted in bringing home to the people the fact that birds are of some service to mankind. Many people have absorbed the idea that birds were created to protect man's gardens, trees and crops from insect pests. This is not the fact. When birds were created there were no shade trees, no orchards, and no gardens to be protected from such pests. The relations of birds, insects, and other forms of animal life are not quite so simple as this belief would indicate. No man is wise enough to understand fully the marvelous interrelations and interdependencies existing between the various forms of animal life, but we know that there exist between vegetation, insects, birds, and other animals, what may be termed primeval economic relations, a sort of dependence one upon another. The existence of each one, and the place that it fills in the economy of nature, depend largely upon the existence of the others and the fulfilment of their functions. Therefore the undue increase of any one form of vegetable or animal life is prevented by others which feed upon it.

Birds, because of their telescopic vision and their great powers of flight, fill a place in this great plan which can be filled by no other form of animal life. They perform the functions of an aerial police force, being better able than any other class of animals to concentrate quickly from wide areas upon any unusual destructive outbreak of insects or other animal pests, and reduce it. Such an influence, working on destructive or potentially destructive pests, must have a beneficent relation to agricultural industries, and it is in this way that birds help us. Birds have a marvelous capacity for destroying pests. They are wonderfully active, and tremendously energetic. Their circulation, respiration and digestion are remarkably rapid, for the constant wasting of the tissues calls for exceedingly rapid renewal. Constant fuel is required to keep the vital fires burning brightly. Hence, birds require an enormous amount of food.

Audubon tells us that a woodcock will consume its own weight in earth worms in one night. This seems rather a large story, but my friend, Herbert K. Job, caught a woodcock and kept it for some time, and he found by experimenting with that bird that in twenty-four hours it ate twice its own weight in earthworms. That seems like a remarkable story, but many years ago Professor Treadwell, of the Boston Society of Natural History, procured, for experimental purposes, some young robins fully fledged and just ready to fly. He fed the little birds all he thought was good for them, but at the end of a few days one of them died, and upon examination he found that it had starved to death. Upon this, he fed the survivors more and more until they had all that they seemed to require, and he found that each one of these young birds needed about 65 per cent more than its own weight in solid beef every day, or fourteen feet in length of caterpillars or earthworms. Many experiments of this kind have been made since then and they fully corroborate those of Professor Treadwell. If a man were to consume food in that proportion, he would eat in one day 67 feet of bologna sausage three inches in diameter.

From the hatching of the young of our insectivorous birds until the hour of flight, is only from one to three or four weeks, and in that brief period the birds must grow to nearly the size of the parents and must develop all organs, muscles, bones and functions, and at the same time grow long flight feathers to enable them to wing their way through the air. Hence the necessity for the enormous amount of animal or insect food which best serves to promote such bone, flesh and feather growth. The parent birds, because of their activity, require nearly as much food as the young. Therefore the birds of a township, a county, or a state, must consume enormous quantities of insects, most of which are injurious or potentially injurious.

Reed estimates that the birds of Massachusetts consume 2,560,000,000 insects or 21,000 bushels each day. I believe that Professor Lawrence Bruner estimates that the birds of Nebraska, a much larger state, eat 170 carloads daily. Birds have tremendous appetites, and we can easily see why they do so much good when feeding on our insect foes, and so much harm when feeding on our fruit crops, but it is interesting to note that we can count upon the fingers of one hand practically all the birds in Maine that are really injurious to the agriculturist.

The services of birds to mankind are of greater value in field or forest than in orchard or garden. Birds cannot nest in the garden, as the operations of tillage drive them out, and unless you have trees, shrubbery and vines in which the birds can nest you do not get so much benefit from them in the garden. Nevertheless, the swallows and the night hawks and other birds which take their food in flight come in and eat insects that otherwise would destroy crops, and birds like the robin are very useful in the garden because they dig into the ground and eat white grubs, wire worms, and other insects that destroy the roots of plants.

We can use insecticides and other means to control insect pests in the garden or orchard, but we cannot spray with poisons all the trees in all our woods, and we cannot drench with insecticides the grass that our horses and cattle eat. Therefore we are absolutely dependent upon the birds and other natural enemies of insects to protect the forest trees and the grass crops and pastures of the country from any undue increase of insect pests. Wherever birds exist in sufficient numbers, they perform their office well, except where some foreign pest has been introduced which they are not accustomed to.

Chipping sparrows are very useful in the garden because they feed on the insects that destroy the low growing crops, and they also eat the seeds of weeds. The Department of Agriculture tells us that the native sparrows of the United States save the farmers of this country $35,000,000 a year by destroying weed seeds. I do not know how they figure that out, for it seems to me that weeds are a benefit to the farmer in one way. because they keep him tilling the soil,—but that is the way they figure it, and birds destroy enormous numbers of the seeds of weeds.

The song sparrow, which feeds on the insects of the low ground, such as the cabbage plant lice and cabbage worms, is a little bird which sings almost the year round, either north or south. It is well named the song sparrow.

I suppose that if you orchardists had enough chebecs in your orchards you would not have any railroaded apples, because this little flycatcher, so Prof. Hodge says, eats the fly, the parent of the railroad worm. If we could only attract these little birds into our orchards, we should have less trouble with the railroad worm. Any birds which eat fruit worms are useful in the orchard. We find that many birds in the orchard eat insects which you cannot destroy by ordinary arsenical spraying.

It is an interesting sight to see a vireo feeding her young. These young when recently hatched are naked and blind and know only enough to hold up their mouths and open them for food. And the mother bird swallows insects and partly digests them in her stomach or gullet and then regurgitates them or throws them up into the mouths of the young. She forces her bill right down into the throat of the young bird. You may see a pine warbler feeding her full fledged young. She feeds it with full grown insects often alive. She usually forces them well down into the throat, and if she does not, sometimes the insects get away. I remember seeing a large hairy caterpillar crawl out of the throat of a young bird.

I suppose that there is no help for the grass in the fields unless we have the birds and the other enemies of insects there, for we cannot spray with poisonous insecticides the grass that we must cut for hay. Therefore we must depend on these birds, and the meadow lark with young in the nest is worth four or five dollars a year to the farmer because of the grass-eating insects which the little family consumes. All the birds of the field are beneficial in the same way. They feed on the insects which destroy the grass, and were it not for these birds you would soon have no grass crop. Let me give you evidence in support of this statement. Whenever I speak to farmers about the crow, every time I open my mouth I put my foot in it, for no matter what I say they disagree with me. I know of one old farmer who got up in a meeting of the Massachusetts State Board of Agriculture and asked that a bounty be put on crows. Some one said, "If you put a bounty on crows in this state, they will bring dead ones in from other states and collect bounty on them." The farmer said, "That would be a blessing. Kill them all! I would like to wring the neck of the last crow in Massachusetts." Many feel like that, but the crow is a necessary evil. In the decade of 1740-50 in all the New England colonies bounties were paid on crows by every town clerk, and crows and blackbirds were so slaughtered that by the year 1749 they were nearly all gone. Then a grass famine occurred and the farmers of Massachusetts and Maine and all these New England colonies had to send to England and Pennsylvania to get hay enough to carry their cattle through the winter, because, as the people believed, the cut worms, grasshoppers, locusts and other grass insects increased so much as a consequence of the destruction of these birds. There never has been a general bounty paid on crows since. If the crow is doing harm kill him, if you can, but do not exterminate the crow.

I believe that birds are just as necessary in the woods as they are in the fields. I have lived eight years of my life in the woods and have watched the birds night and morning, spring and summer, fall and winter and if you could see what I have seen it would surprise you. I have seen a scarlet tanager come to a bush and take every caterpillar off it. I have seen a little flock of kinglets come to a pine grove, stay there all winter, and clean off the eggs of the plant lice from those trees so that no plant lice could be seen the next year. Many other things of that kind I have seen,—birds coming in the spring and staying until the fall and destroying all kinds of destructive tree insects. Where the birds have been killed off the trees have been stripped of their leaves by insects, the borers have gotten in and the trees have died. Trees are particularly essential in a mountainous country. I want to tell you of what happened in Northern China, where the people killed the birds and destroyed the trees. The people became so numerous there that they killed the game and the birds and cut down the trees, and by and by there were no trees left; and they even dug up the roots of the trees. As the trees died they cut them down and dug out the roots. Then it came on winter and spring and the rain poured down on those bare mountains as it rains on the roof of a house. As it ran off, it tore the soil from the mountains and carried it into the valleys, and the floods came and carried that soil down the valleys to the sea. And today no man, no animal, no plant, can live there. The continual floods and the continual denudation of the country has absolutely ruined it, and there in those valleys you see the ruins of great cities. A land where formerly a numerous population existed is today a desert because they destroyed the trees and destroyed the birds.

In passing I must say a word about so-called hawks, real hawks and owls. The night-hawk, so-called, is not really a night bird,— it flies in the daytime also and is not a hawk at all. It has a small weak bill. It could not kill a bird and its feet are very weak. Its main feature is its mouth, and next its stomach. It has a great mouth and a great stomach. The mouth opens back to the ears. Professor Harvey, I believe, found 500 mosquitoes in the stomach of a night-hawk. The mosquitoes and the flies that birds eat are very dangerous, especially in the south, carrying the germs of yellow fever, typhoid, and other diseases. Still, we kill these birds. No one should ever shoot a night-hawk. There is a real hawk that is one of the most beneficial birds,—the rough-legged hawk. I do not mean to say that all hawks are beneficial. Some are destructive. But this one has almost never been known to kill a bird. I think the first record of that sort was noted last year, when some of these hawks in the west killed meadow larks. They feed on animals mainly, on field mice, etc. Now do you know what would happen if these field mice were not held in check by hawks and owls and birds of that order which continually hunt them? Every pair of these little mice will produce from twenty to thirty young every year. Just think for a moment. Figure out and see what it would come to in a few years if these animals were not held in check.

Wherever the hawks and owls have been entirely killed off field mice have increased so that they have eaten up everything green on the face of the earth, taken away the pasturage of the cattle and left the country without a green thing in it. And there is no hope and no help for such an irruption of mice as that until a flight of hawks and owls comes along and cleans them up.

The owls are the target of ignorance and superstition and have been since the dawn of history, but among them are some of the most useful of birds. Our two large owls, the Barred Owl and the Great Horned Owl, however, kill some game and poultry. I will tell you more about the smaller owls later.

The spotted sandpiper, a very useful bird, is one which we should never kill, because it feeds on insects in the grass, the corn field and the cabbage field. At the present time they are protected by a national law, but up to within a few years people have been allowed to shoot them most of the year; even in the summer when the little young birds were running about unable to fly, in most of the states the law has allowed the gunner to kill them.

The sandpipers or peeps of the seashore are also useful to the western farmer, feeding especially on grass insects in the interior. In the fall they go south, along the Atlantic coast.

The smaller herons are not very handsome but are useful. They feed on fish and the insects of the low ground, such as the low land grasshoppers and the army worm, which if they are not held in check will march into the uplands and destroy the crops, as they have all over the eastern country largely this year. Dr. Gaumer tells us that all along the coast of Yucatan and Mexico, where herons and other littoral birds have been killed off, disease has increased among the inhabitants. No one knows why, but some people believe it is because these birds, which were killed for millinery purposes, formerly fed on the larvæ of the yellow fever and malarial mosquitoes and so saved the inhabitants from a certain amount of disease.

The gulls of the seashore are scavengers. They pick up dead fish and decaying matter along the shore, and the garbage that is thrown out, and keep it from floating in on the beaches. The

Mormons in Salt Lake City have recently erected a monument costing $40,000, to the sea gulls, because they saved the early Mormon settlers from starvation by killing off the crickets which destroyed their first crops.

The passenger pigeons, the wild pigeons so-called, blew across this country at one time in greater numbers than any other living species. No birds in the world, so far as we know, were ever so numerous on their nesting grounds and roosting grounds, as these pigeons. Many millions of them nested in certain localities, some in Maine, and all through our northern United States. They nested or roosted there in the summer and went south in the winter, and they have been destroyed at all times of year without any regard to law. Thirteen millions were sent from one town in Michigan in two years to the market; vessels were loaded in bulk with them. I have seen them on North Market Street in Boston in barrels standing the whole length of the street. And today they are gone, absolutely destroyed by the market demand. Therefore we must stop to a certain extent the marketing of wild birds in this way.

There is another way in which birds have been exterminated and that is the killing of them for ornamental purposes, for the ladies' hats. Thirty years ago it was fashionable to wear terns or sea swallows on bonnets. There was no law enforced against it and hunters came to the islands on the Maine coast where the birds breed and shot them as they flew over. If one fell down and cried out the others came about and the gunner shot them all and left the little young birds to starve in the nests. That is the way the ladies got their feathers! Ladies, you do not need these feathers; you are lovely enough without them.

Just a word about how we are trying to protect these sea birds now. It should interest you people here in Maine because you have some of the finest bird colonies in the world on your coast. Right off your coast are the bird islands. The Audubon societies are trying to protect these birds by appointing as wardens lighthouse keepers and others up and down the coast to watch and protect them. Last summer I spent a little time on Duck Island, near Mt. Desert, where there is a fine colony of Herring gulls, which are there now in great numbers and very tame because they are not hunted and molested. I have seen the lighthouse keeper feed them by hand. Today in almost every one of these colonies, wherever the little young birds are growing up, somebody is looking out for them and protecting them. And so we have increased these birds of our own sea coast here, on the Gulf of Mexico, on the Pacific coast, on many lakes in the west, and everywhere where they are breeding in colonies. Thirty years ago there were only about a dozen or twenty pairs of Laughing Gulls left in New England. They were on Muskeget Island. A warden was put on that island every year during the breeding season to protect them. Today, thousands are there, and they have scattered along the coast from Massachusetts to Maine. Mrs. Russell Sage has recently established a large reservation of this kind in Louisiana, for water birds and land birds. The Rockefeller Foundation has established another, and these reservations will in the end be the salvation of the birds.

There is another danger that menaces our small birds and it is the foreigners that come from other shores, who kill birds in their own countries. Here they destroy some of our most beautiful and useful birds. We welcome those people. They must come here to do our work, but we must try to teach them not to kill our small birds. In the south both blacks and whites kill small birds. Three years ago I was in South Carolina and I watched a dozen colored men shooting bobolinks and other small birds. At noon they came and sat on a levee or dike as they called it and ate their lunch, and I went there and asked them how many birds they had. They laid out their burlap bags in which the birds were kept and counted them out by the dozen, and if their count was correct, they had killed over a thousand of those birds that forenoon. These birds come in great flocks and they are supposed to be killed because they eat rice. But there the rice culture is going out. It is almost extinct and these birds are not killed for that purpose at all but for the twenty-five cents that the blacks get for the birds and for the sixty or seventy cents which the whites get when they sell them again. That is the reason they are shot today in the south and that same sort of thing has been going on all over the south. We have now a law—a Federal law—for the protection of migratory birds, which, if we can enforce it, will eventually do away with the most of this shooting.

Now, having given you some idea of the public means we are taking to protect our birds, let me approach the most interesting task before us. That is the protection by the individual of the birds about our farms and homes, and the way to go about it. A short time ago in the west a magazine offered a prize for a paper on how to keep the affections of a husband. The papers offered in the competition were not to contain over a thousand words each. The paper that took the prize had only three words, "Feed the Brute." Now if you can find the way to a man's heart by his stomach, perhaps you can get a good deal nearer a bird in that way. Birds need shelter, protection and food, and to be made to feel at home.

On the north side of my house at Wareham is a thicket facing to the south, shutting off the cold wind, and there are some brush heaps. If I wanted to attract birds to my front yard I would have a brush heap in it. You may have a few bushes and vines to cover and screen it. That would help, and you can throw food under the brush heap, and there is a refuge for the birds, where they can fly from the cat or the hawk and if it is covered with pine boughts in winter that will keep the snow out and make a refuge the year round. My eldest boy thought he would like to have a feeding station for birds. This was long before we had feeding stations as we do now, and he put out an open dry goods box lying on its side with the opening to the south, threw a little chaff in it, put it up next to the thicket and then gradually every day moved it up nearer and nearer the house, so by and by we had it right under the windows. And the birds began to come; sometimes sixty or eighty birds could be seen around that box in the winter, juncos and quail, and we had nearly all the seed eating birds that can be found here in winter, around that box or on the trees near the house at one time or another.

From the windows on the other side of the house the children threw out some Japanese millet. All our seed eating birds like Japanese millet, so they were attracted to the house. In the fall, not waiting until winter, we took bones from the kettle and tied them on the trees at some distance from the house. What I want to show you here is this,—that it will not cost much money to attract the birds. It can be done without the expenditure of a dollar. Of course you can buy suet and meat trimmings, but refuse meat or fat is all that is necessary to attract insect eating birds.

Later our old friend the scarecrow was brought up from the grain field as a sort of under-study for me. It was put up out doors near a kitchen window with some beef scraps or suet on its hand. My little girl said, "Now you don't really believe those birds are going to mistake that scarecrow for a man?" "No," I said, "but when I get out there made up the same way, I expect they will mistake me for the scarecrow." And when I had got them coming to the side and to the hand of that scarecrow and on his shoulder, I went out and put on that coat and hat and put out my hand and the little chickadees came and fed from my hand. If you ever have a little bird come and alight in the middle of your hand, I am sure you will want to protect those birds, and children, when they find a bird will come to the hand, will never think of injuring one. It is a good thing for the bird and a good thing for the children, and much better for the children than for the birds.

My youngest boy, who likes to draw birds, thought he would like to have the birds right at the window so that he could sit in the warm room and draw them. So he put little bits of suet and meat on a bush, which he fastened up outside on the window sill, and the chickadees, jays, nuthatches and woodpeckers came, and by and by he could sit there and draw all the birds at the window without any trouble at all. He could put his face right up to the window and they were not afraid of him. They had got accustomed to him and knew him perfectly well. My book, "Useful Birds and Their Protection," tells the story, and if any of you would like to pursue the subject further you can get the book from the State Board of Agriculture at Boston, in the State House; and I want to say that I feel at liberty to advertise it because I make no money on it. It is sold by the state at cost. It is a book of 500 pages with many illustrations, and is sold for $1.00.

A little more about this bush. Early in the morning one might see the downy woodpecker climbing the bush. His climbing tools work only one way. He has to go up forward and down backward, like the bear. But the nuthatch the children used to call the little upside down bird. It was just as happy wrong side up as right side up. A pair of these birds got so used to our house and so much pleased with it that they undertook to find a nesting place on it or in it, and the little female bird got into a window upstairs and there she fluttered away at the wrong window, trying to get out, when nobody was looking, until she died, and the little male stayed around there for a week or two apparently mourning for his mate. These birds became so tame we had to keep our windows closed if we wanted to keep them out of the house.

My oldest boy wanted a birds' Christmas tree. He had heard how the Norwegians put a sheaf of grain on the roof of the barn for the birds at Christmas time, and so he put up a shelf outside a window with a little pine tree on it, putting little bits of meat or suet on the tree, and putting some chaff on the shelf and a little seed or grain. On a cold snowy morning all he had to do was to push the snow off, and the birds came, and soon we had birds galore. We also put up nesting boxes for the birds around the house in different places all winter. We put hay or cotton in them because the chickadees, nuthatches and woodpeckers like to find some place where they can keep their toes warm on winter nights, and we found in some cases they used these boxes; also, the chickadees used them. Then they nested in one in the spring.

Many birds are attracted to a window shelf of this kind and sometimes the shelf will be crowded. My friend Bowdish has a photograph of purple finches on his window shelf and sometimes he has had twenty-two or twenty-three birds of the same kind on the shelf, and often we had about that number of birds. It is simply a matter of a little care and absolutely no cost to attract these birds around your house where you can protect them.

Now we come to bird houses. Nowadays in our country we so trim our trees that the natural cavities in which birds nest are nearly all destroyed, and it is a good plan to put out nesting boxes for the birds. If you put them out in the right way you get the birds,—without question you will get them. It is not necessary to have a great ornamental martin house, although that is a fine thing for the purple martin; but anything will do that is near the right size and the entrance hole about right. A barrel with a zinc roof and some boxes inside for the birds to nest in makes a good cheap martin house. A common box was taken by a bluebird at once because it was the right size and the hole was an inch and a half in diameter and it was put up in the right place. The roof should project out over the opening to keep the snow and rain from getting in. A perch is not necessary, but some birds like it. And then the box may be deep enough so that the cats cannot very easily claw the young birds out. They have a habit of doing that.

It is most interesting to have a bird house so situated that you can watch the home life of the birds. That is what we call the observation box, which I have used for about forty years. We had such a nesting box at Wareham. This box is set on a sill of an upper window. Looking from the window out you see a door opening down on to the window sill and behind the door a pane of glass is set; then there is a roof which fits over to shade the entrance hole, which is made an inch and a quarter in diameter for the chickadee. We put a little meat or suet or something of that sort during the winter on the window sill, and in the spring my little girl came to me and said, "A pair of little birds, chickadees I think, are carrying sticks and feathers and things into that box." "Now," I said, "you watch those birds and wait day after day until you see them carrying in insects or anything like bugs; then you can open the box." Never was any box watched more closely than that, and by and by, two or three weeks later, she came to me in great excitement and said, "They are carrying in bugs." Then we opened the box and saw the nest with five little young birds in it. After we had watched them for a long time, we came one day to photograph them. The little ones were about ready to fly and as soon as we opened the glass one of them felt the fresh air and away he flew, right into a pear tree and the others commenced to fly out. Four of them alighted upon me, and then the father bird came to the roof and the mother bird to my hat and they talked and coaxed until away the little birds went. We did not get that picture because we were short of plates. Later we caught these little ones and put them on a stick but we could not make them stay to have their pictures taken for when we got four on it seemed that about five would fly off. We finally gave it up and took the only two that would stay.

I have said that almost anything will make a bird house. We used a lot of old tin cans. These were all bird houses, used by a bird or squirrel except an old tin teakettle. They did not seem to care for that, or else it was put in the wrong place. A tomato can will do, with a hole cut the right size and the edges turned down, and a little hole in the bottom so the rain will run out. A box was picked up back of the barn and a hole cut in it for the bluebird, and the bluebird took it the next day.

Then we made an owl box, and I will have to tell you something about these owls. I went out one day in the grove on the south side of my house, a pine grove about sixty years old, and I picked up 16 elongated balls of fur. I took them into the house and showed them to my prospective son-in-law, and asked him what they were. He said, "Those are mice croquettes a la owl." He had been studying biology in Clark University, and he knew what they were, but you would not find much nourishment in those croquettes. I once had a young owl which I kept for a while in a cage. He was a very modest owl. He would never eat when any one was looking, but if you put a rat, alive or dead, into his cage, and went away for a minute or two, and then came back, you would find him standing up on his hind legs just the same, with the rat's tail hanging out of the left side of his mouth. I always thought that owl was left handed. The owls do not chew up rats and mice. They do not Fletcherize at all. They tear the food to pieces if necessary; but they swallow it whole if they can and then the stomach takes the little animal and digests all the soft parts complete and clean, polishes up the bones even, and then the stomach takes the bones and the fur and winds them around, the fur outside, and the whole thing is thrown up out of the mouth. That is what I found on the ground. We found in those little balls of fur the remains of thirty-four of the mice that eat the bark of our fruit trees, and I said, "We must keep owls here." So we put a box up in the grove and the very next night there was a little screech owl in the entrance. The owls kept coming, and going in and out of the box, until they finally disappeared. One day I climbed up and looked in and there was the nest all built and the mother bird sitting on her eggs. We left the nest alone until the eggs were hatched, and then we could do anything we pleased with those owls. We could take the box down from the tree with a claw hammer and screw driver, nail it up on another tree in the sunlight, take the whole front off, take any picture we liked, and then put the front on and nail it up again. First we saw the mother bird sitting on the bunch of little downy young which looked like little chickens with hooked beaks. Later the young had a little gray coming in the white plumage, and still later, when ready to go out into the world, they were gray all over. All that summer those owls stayed there. They killed only one or two small birds. They killed several blue-jays and quantities of mice and noxious insects, and the next year we had more small birds than ever before. The mice formerly had destroyed the birds, so by killing bluejays and mice these owls kept the enemies of the small birds away from them to a certain extent. So long as we kept those owls we never had a fruit tree troubled by mice.

I went down to a neighbor's one day and he said to me, "A pair of chickadees are looking my house all over. What do you think they want." "O," I said, "probably they were reared in a nesting box at my house, and they are looking for a bird house here." I went to the dump and picked up a two quart tin can and made it ready and put it in the tree, and these chickadees took it in twenty minutes. Later my neighbor put up other cans and they were all used sooner or later by birds or squirrels. There was in a little box a chickadee's nest at my kitchen window made entirely of cotton that we put in. The birds merely dug a hole in the cotton, put in one feather and there was the nest; and soon the mother bird was sitting on the eggs. I think those little birds took as much interest in our housekeeping as we did in theirs, for they watched the dish washing and everything of that sort for a long time every day. Now, what I want to call your attention to is this: By putting up boxes we increased those chickadees so that where the first year we had one nest and one brood of five, the third year we had three nests and two broods in each nest, with from seven to nine in each brood. And the result on the trees was something remarkable. We did not have to spray our trees about the house for ten years while we protected the birds there. People will tell you that the birds will not eat the hairy caterpillars. We rarely found many caterpillar nests through our orchard. One year there was one left and we thought the birds were not going to take it but the last time I saw it, when I thought I would take it off, I went to lunch and when I came back it was torn open. The birds had taken the caterpillars out and they were nearly all dead on the ground or eaten. The birds kill a good many by tearing out a portion of the inside and eating it. But you must have birds enough, or they will not do that.

Now we come to the birds of the woods. There is a log cabin in which I have spent a great many months in different years. We attracted the birds there. A chimney swift had her nest in the chimney. We put a mirror in the fireplace and could see what she was doing. On the ends of the logs the robins nested. At the doorway a vireo had her nest and the male staid on the nest and sung as they often do. Right overhead was a rose-breasted grosbeak's nest and the male—here is another bird which sings on the nest. We often saw and heard him singing. The peculiar thing about that bird is that when a hawk came overhead he would continue his singing just the same, but his voice would lower and sound as if it came from away off in the woods. He seemed to be a sort of ventriloquist. Right at the end of the cabin a great barberry bush grew. We fertilized it with ashes and other fertilizer, and so it grew six or eight feet high and it was covered with barberries. The grouse and the partridges came from the woods and fed on the berries within six feet of our window. We never could get a picture of them because they always came in the morning when the light was too poor to take the picture of a moving bird; but they came about the place and we sometimes saw the mother birds with their young. If you have some of the plants which bear wild fruit that we do not eat, and protect these plants, or if you set them out, you can attract the birds in that way. You may put out a little water in a pan in which birds bathe and drink and in a dry time a little mud is appreciated by the robin and you may see her taking it for her nest. The swallows and the phebes will do the same. A fountain on the lawn after the grass is cut so that the cats cannot sneak up, is another nice thing in which to water the birds, and if you give them water enough they are not so liable to take the fruit. A few species of birds because of their great appetite are very destructive to some kinds of fruit.

A little about attracting birds in the summer. There are a few things we can do, which I have not time to explain. In one case meal worms were used to attract robins, bluebirds and other insect eating birds in the summer and they became very tame.

I will close with the story of a bird house that two children put up at the beginning of the summer vacation. The children had seen their father put up bird houses and had noticed that birds nested in them and they wanted a bird house of their own. So they went up in the loft somewhere and found an old bird box. They got a small post and nailed the bird house on—not very true and straight—and then they got some tool and dug in the hard, stony ground, and finally after two days they got the nesting box up. This was nearly the first of July, rather late for a brood, but it happened that a female bluebird had just reared her young in another box and she turned them over to the care of the male and went right about building her second nest in this box. The female often starts another nest while the male takes care of the first brood. These children watched that box very carefully. They had a little door in front so they could open it to look in, and everything went well until the young birds were almost ready to fly, and then happened something which often happens. There came a cold hard rain and it rained so very hard that it either beat the insects down into the ground, or the old birds were wet down and caught by cats,—at any rate they disappeared. The old bird was never seen again. Prof. Hodge came home that night and he heard these little birds in the nest crying for food and said, "Here is something wrong." He went down and found them hungry and undertook to feed them but they did not know him and they would not feed. Finally he hit on the plan of whistling and calling like the old bird, and he crept up to the box with some meal worms in his hand which he had brought for the young birds. Then they came into his hand and fed and then away they flew into the trees and staid all night under the leaves in the rain. The next morning it was still raining, and Dr. Hodge came along down the sidewalk holding up his umbrella and a little bird came from an apple tree over the fence and alighted on his arm. He took the little one into the house and put it in a shoe box. To make a long story short, by the next morning all those birds were in that box. The children undertook to feed those birds and take care of them and I can assure you they had all they cared to do. They had to take an insect net and sweep the grass, the ground and the trees to get enough insects to feed them. But they managed to do it, with the help of the meal worms, and so the little ones waxed fat and hearty. By and by there came a day when they wanted to fly away.

They got to the window and flew up and down the glass, and the children opened the window and let them go. They never expected to see these little birds again, but the next morning back they came, calling for food. The children opened the window and spread the window sill with food and every day for some days they fed them in that way. Finally the birds flew away and did not come the next morning. So the children went out under the trees and called and the birds came to be fed, and all through the summer whenever the family sat out in the yard under the trees the bluebirds would come to their hands to be fed.

If we can teach our children to take an interest in the living birds, to put up bird houses, and to care for the orphaned young, such children will always have a tender feeling for the birds and thus the whole problem of the protection of birds for the future will be solved.

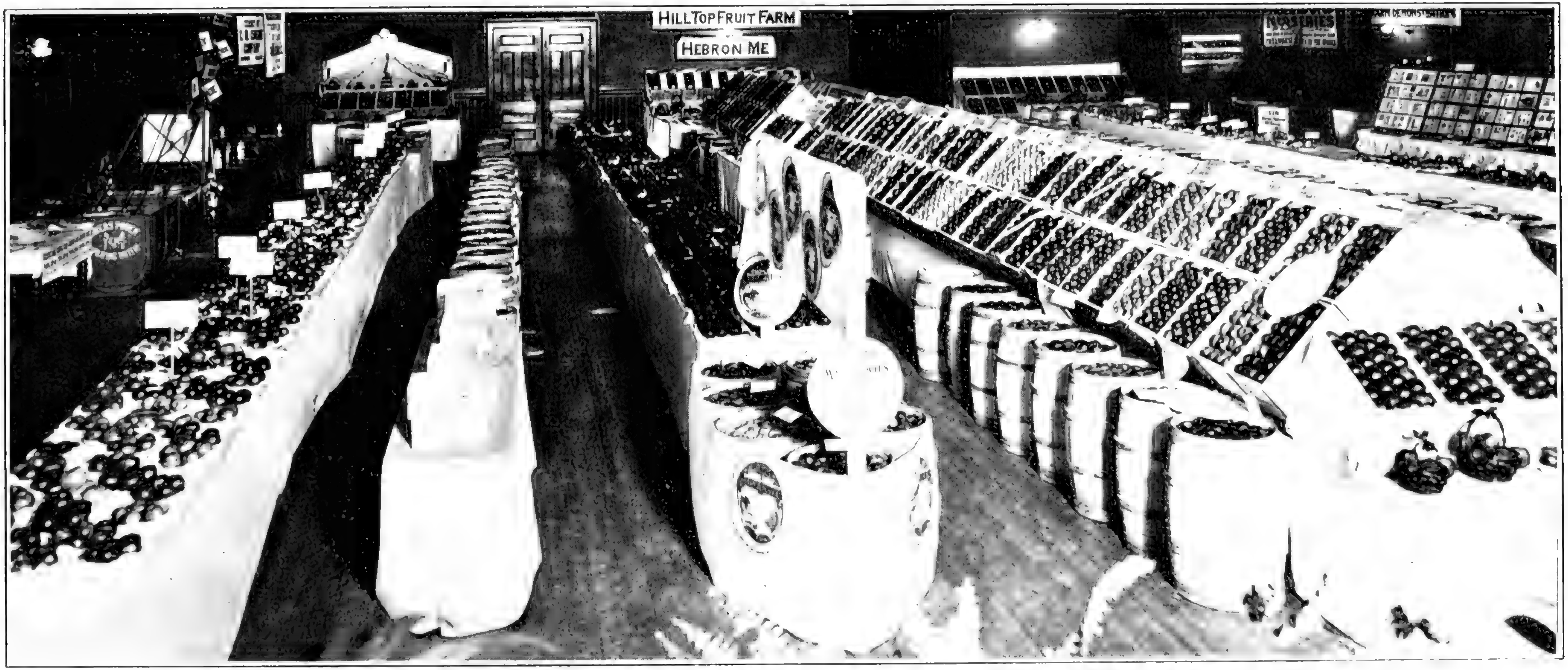
WEDNESDAY MORNING.

ADDRESS OF PRESIDENT.

W. H. Conant, Buckfield.

Ladies and Gentlemen:

It is a pleasure to welcome you today to this, the fifty-first annual meeting of this society, and also to congratulate our members on the splendid crop of clean fruit produced this season, which demonstrates over again that Maine can produce both quality and quantity. With every season come new problems and in this respect 1914 is no exception. While the year 1913 closed with a tremendous shortage of apples and high prices, the season of 1914 opens with a normal crop, and with it that wail we have so often heard, big crop and over production. There is no question but that the European war has had a paralyzing effect on the foreign markets as well as our home markets. Germany in recent years has been a heavy buyer of Maine apples. This trade has been entirely cut off. England, however, has taken a large quantity of apples at a low price; this, with the increase in ocean freight charges, and the extremely



Annual Exhibition Maine State Pomological Society, Bangor, Nov. 17-19, 1915, looking down the left side of City Hall.

hot weather causing fruit to land in poor condition, has made net returns small on early shipments. With cooler weather and apples arriving on the English markets in good condition, more satisfactory returns are being realized.

Our home markets have been dull and many of them overstocked with out-of-season varieties. I received a letter from a Providence produce house, October 25, saying that the market was overstocked with winter fruit, such as Ben Davis and York Imperials, but was nearly bare of fruit fit for immediate consumption. With our home markets overstocked and dull, there comes a cry through the press and otherwise from the consumer who is paying the same price per peck as last year when apples were scarce and high. It must be apparent to every interested fruit grower in Maine that our present system of distribution is bad, and will continue to be so until the growers apply some remedy looking to a solution of this problem.

Our greatest need at present would seem to be coöperation or business organizations among the producers, not to fix prices or control markets, but to erect warehouses and storage plants at every shipping center throughout the fruit belt, which would enable them to more economically and efficiently market their fruit.

The storage problem has been previously brought to the attention of this body and is an important one. I would recommend that this Society, at the coming session of the Legislature, ask for an appropriation sufficient to provide for an experimental storage plant in connection with the state farm at Highmoor, to demonstrate what sort of storage would best meet the needs of this important industry, and that a committee be appointed during this session, to be known as the storage committee, to carry out these recommendations.

While there have been laws enacted regulating the shipping of nursery stock into our state, and rigid inspection provided for, that no diseased stock shall be permitted to enter the state, yet the fruit industry receives a tremendous blow every year, in that an enormous per cent of the nursery stock shipped into Maine does not prove true to name. This is a matter of vital importance to every fruit grower and is worthy of careful consideration looking to some remedy whereby the purchaser may be able to secure stock with some assurance that it will prove true to name.

I wish at this time to express in behalf of this Society our appreciation of the untiring efforts of Maine's Commissioner of Agriculture and of the hearty coöperation and valuable service rendered by that department in promoting the interest of pomology throughout the state; also our appreciation of the assistance rendered by the extension department of the College of Agriculture, University of Maine, through their county demonstrators.

The severe cold weather of the past winter brought relief to our fruit growers so far as the brown-tail moth is concerned and relieved a strained situation relative to picking the winter nests. However, with this tremendous setback, they will soon be with us again, and the laws regarding their control should be strictly enforced.

The tent and forest caterpillar have done an alarming amount of damage the past season in many sections of the state, completely defoliating thousands of fruit trees as well as a great many shade and ornamental trees. It seems unfortunate that a pest so easy to control should be allowed to continue its depredations. There is still need of a vigorous campaign of education regarding the control of these orchard pests.

While we have produced a good crop of practically clean fruit the past season, yet the fungus troubles are much in evidence and it is necessary that our growers keep up the fight against these diseases if they hope to produce fruit of the finest quality and place Maine at the head of the list as an apple producing state.

I am glad to report that many of our growers who were not at first in sympathy with the Maine law relative to the grading and branding of apples realize today that it is the only means by which we can hope to raise the standard of Maine fruit in the markets of the world. As a direct result of this law, buyers of fancy fruit have come to Maine this season for the first time and have been strongly impressed with the quality of fruit and the way it was being graded.

I believe there are few wilful violations of this law, but through a lack of proper knowledge as to what constitutes a proper branding, too many barrels are shipped out of the state poorly marked, and it is my judgment that a larger appropriation should be made, providing for the enforcement of this law to enable the Commissioner of Agriculture to place more inspectors in the field during the shipping season and through them carry on a campaign of education regarding the proper grading and branding of apples.

The splendid achievements won by this Society in the past should spur us on to even greater efforts in the future in carrying on our educational campaign for better fruit, better grading and branding, more coöperative organizations among our growers, more warehouses or central packing houses, that a more uniform pack be secured, and better shipping facilities.

To accomplish this our Society needs the hearty coöperation of every live fruit grower in Maine, and I believe a strenuous effort should be made along this line, until every interested fruit grower is enrolled as a member of the Pomological Society, and the fruit industry of Maine is placed on a solid business basis.

ORCHARD EXPERIMENTAL WORK IN NOVA SCOTIA,

CONDUCTED BY THE DOMINION EXPERIMENTAL FARMS.

PROF. W. SAXBY BLAIR, Kentville, N. S.

Mr. Chairman, Ladies and Gentlemen:

The experimental farms with which I am associated are under the control of the Dominion Government. A number are located at different parts of the Dominion. In Nova Scotia we have two. The one I am associated with is devoted pretty largely to the fruit experimental work. We are located in the principal fruit growing section of Nova Scotia, hence we naturally are supposed to do all we can to assist the fruit growers of that particular section. We have large fruit interests there, and our first thought in taking up the work from an experimental standpoint was to find out, if possible, how to assist the growers to grow a better quality of fruit and to get more money out of it than they are getting at the present time. We find, even in these sections, where tree fruit growers are well organized, where they have the best facilities for getting their products on the market and getting the biggest prices for these products, that in a great many cases they are not growing the product they should, hence they do not reap the full reward of their labor.

In looking into the matter for the purpose of deciding what was the best to do in an experimental way, we found that too large a proportion of No. 3 fruit was grown. Our people had failed to recognize certain things which are well recognized by the western fruit grower, and which are recognized no doubt by the majority of your fruit growers. Take, for instance, the one thing—the thinning of fruit for the purpose of getting the largest returns from the orchard. It was the office of the experiment station to take up the matter and prove that the removal of a per cent of fruit by thinning would not mean any loss, but a decided gain to the fruit grower. We planned out a series of experiments so that we could tell the fruit grower at once whether he could make any profit by removing fifteen to twenty per cent of the apples. The results are tabulated herewith. This work has been conducted for the past three years.

APPLE THINNING EXPERIMENT—1912.

To determine whether any gain would result from removing some of the fruit from heavily ladened trees, experiments were conducted during the season in an orchard in Berwick, N. S. The variety in this experiment was Gravenstein. The work of thinning was done on July 30. This was about two weeks after the usual drop had occurred. The work should have been started ten days earlier for best results. The trees selected were as nearly alike as it was possible to get them and they had apparently the same set of fruit. From the thinned trees all spotted and ill-shaped fruits were removed, and only one apple was left to a fruit cluster. The apples were left from four to six inches apart and were evenly distributed over the tree.

After thinning, the ground under the thinned and unthinnned tree was cleaned, and apples falling after that time were counted. This was done to find out whether thinning would prevent excessive dropping which occurs in Gravensteins if they are heavily filled just before the fruit is mature, and also to get the number of apples each tree had on it to start with. A record was kept of the number of apples thinned from the tree.

It was found that the thinned tree had 3,137 apples and that the unthinned tree had 4,065 apples when thinning started.

Drops from thinned and unthinned trees.

	Tree Thinned.	Tree not Thinned.
Per cent of total set removed by thinning..	18.5	
Per cent of total set which dropped after thinning	12.2	19.1
Per cent of total set harvested............	69.3	80.9

It will be seen that 19 per cent of the total number of apples on the tree at the start dropped from the unthinned tree and that only 12 per cent fell from the thinned tree. There was a lessened drop of 7 per cent from thinning. This falling for the most part occurred from a little over a week before, up to picking time. The fruit was picked on September 20, which was before any serious dropping had occurred. Apples which fell from the tree at picking time were not counted as drops.

Increase in Size

Apples to the barrel from thinned tree..............	517
Apples to the barrel from unthinned tree.............	593
Per cent increase in size from thinning...............	12.81

Grade of Fruit.

	Thinned Tree.	Unthinned Tree.
No. 1.	70.00	42.00
No. 2	23.80	38.65
No. 3	5.60	16.13
Culls	.60	3.22

This table shows that the thinned tree gave an increase of No. 1 fruit of 28 per cent and thinning decreased the No. 3 fruit 10.53 per cent.

The thinned tree gave 23.29 per cent less crop than the unthinned tree. It will be seen, however, that at the start the unthinned tree had 22 per cent more apples on it. The actual loss from thinning was, therefore, only 1.29 per cent.

From an acre of 40 trees the gain from thinning as indicated by this experiment at prices realized this year, would be as follows:

Yield and Value of Fruit Per Acre.

—	Thinned.			Unthinned.		
	Per cent.	Yield, bbls.	Value.	Per cent.	Yield, bbls.	Value.
No. 1..........	70.00	153.12	$382.80	42.00	93.60	$234.00
No. 2..........	23.80	52.06	83.30	38.65	84.80	135.60
No. 3..........	5.60	12.25	12.25	16.13	36.00	36.00
Culls..........	.60	1.31	.33	3.22	7.20	1.80
Total......	100.00	218.74	$478.68	100.00	221.00	$407.40

This shows a total gain of $71.28. The cost of grading and thinning in the thinned tree was 11 1-3 cents per barrel. The cost of grading in the unthinned tree was 10 cents. The thinned fruit cost much less to grade, and, as is shown, the thinning in this experiment cost only 1 1-3 cents per barrel after extra cost of grading the unthinned is deducted. This made a total cost for thinning of $2.62 per acre, giving a net return of $68.66 per acre in favor of thinning.

THINNING EXPERIMENTS—BRIDGETOWN—1913.

Experiments in thinning were conducted at Bridgetown in the orchard of F. H. Johnson. The variety Blenheim was used. Five trees were thinned and these were compared with seven trees unthinned. The trees were uniform and appeared to be equally well set with fruit. Approximately 17 per cent of the apples were removed from the thinned trees on the 15th of July.

The apples were counted when picked and were packed by the Banner Fruit Co. Ltd., Bridgetown. The apples were shipped to England through the United Fruit Companies of Nova Scotia Ltd. In addition to the usual marking, the letters A. B. F. were put on the barrels of unthinned fruit and M. B. D. on the barrels of thinned fruit so that the shipment could be traced to the selling point.

Assuming that the apples would have been the same on thinned as on unthinned trees, had the thinning not been done, the yield from five trees would have been 19 barrels or the same as that actually picked. This shows that thinning does not necessarily lessen the yield, for the increase in size of fruit makes up for the apples removed by thinning.

The apples were sold on their merit and the purchaser knew nothing of the nature of the experiment. The following prices were received.

	Unthinned Trees. Fruit.	Thinned Trees. Fruit.
No. 1	$1.67	$2.01
No. 2	1.67	1.66
No. 3	.74	.74

The No. 1 fruit for the thinner trees, it will be noticed, sold for 34 cents per barrel more than for the same grade in the unthinned trees.

Thinning Experiment.

Total number of apples on unthinned trees	24,014
Total number of barrels, tree run	37
Average number of apples per barrel	649
Number of apples removed by thinning	2,099
Number of apples on thinned trees	10,426
Number of apples per barrel, tree run	548

Packed Out Results.

	Unthinned Trees.	Thinned Trees.
No. 1	11.75 bbls.	11 bbls.
No. 2	8.5	4
No. 3	9.50	2.75
Cull	4.75	0.00
Slack	2.50	1.25

Profits from Thinning.

	Unthinned Fruit.			Thinned Fruit.		
Grade.	Bbls.	Price per bbl.	Total.	Bbls.	Price per bbl.	Total.
No. 1	31.8	$1.67	$53.10	57.8	$2.01	$116.17
No. 2	23.	1.67	38.41	21.1	1.66	35.02
No. 3	25.7	.74	19.01	14.5	.74	10.73
Cull	12.8	.30	3.84			
Total			$114.36	Total		$161.92

For comparison and calculating on the basis of 100 barrels tree run the above results are obtained which gives a profit of $47.56 from thinning 100 barrels.

THINNING GRAVENSTEIN.

An experiment in thinning Gravensteins similar to that in 1912 was carried on this season and the results obtained compare favorably with the results of last year, giving a like increase in value of the thinned fruit.

The thinning was done on July 22, when the apples were the size of small crabs and the thinning was done so that only one apple was left to a cluster; 14.61 per cent of the total apples on the tree was removed.

The No. 1, 2, 3 and cull apples were counted and the total ascertained. The fruit was packed by one of the companies of The United Fruit Companies of N. S. Ltd., without regard to any difference of treatment.

The following results were obtained:

	Thinned.	Unthinned.
Number apples picked..................	3,447	3,897
Number apples removed...............	590	
Total apples on tree before thinning.....	4,037	3,897
Per cent apples removed by thinning....	14.61	
Per cent total weight grading No. 1.....	65.98	54.43
Per cent total weight grading No. 2.....	14.59	12.44
Per cent total weight grading No. 3.....	19.02	30.23
Per cent total weight grading Cull......	.41	2.54
Per cent total weight grading No. 1 and 2	80.57	66.87

Though it will be seen by the foregoing table that more apples were picked from the thinned than from the unthinned trees, yet when the number of fruits removed from the thinned tree is taken into consideration, we have a total of 4037 in the thinned tree against a total of 3897 apples on the unthinned tree.

By making a comparison between the number of apples on each tree before thinning took place and the number of pounds of fruit taken from each tree, and by calculating the weight of 100 apples as picked from the trees, we find that we have a decrease in weight due to thinning of 1.2 lbs. in every 100 fruits picked, which gives a total decrease of 43 lbs. in the fruit picked from the thinned tree.

By taking the per cents of No. 1, 2, 3, and cull fruit as obtained from the unthinned tree we would have had .18 bbls. No. 1, .04 bbls. No. 2, .10 bbls. No. 3, and .0085 bbls. cull fruit which would have been worth at the prices given below 72 cents., 11.11 and no cents respectively; making a total of $0.94.

As this is a loss due to thinning it should be deducted from the total increase on the thinned tree as shown below.

Values of Thinned and Unthinned Fruit.

Number.	Price per bbl.	No. packed bbl.	Value.	Bbls.	Value.
1	$4.00	4.86	$19.44	4.05	$16.20
2	2.83	1.08	3.06	.92	2.60
3	1.12	1.41	1.58	2.27	2.54
Cull	.25	.03	0.00	.19	05
Total		7.38	$24.08	7.43	$21.39

Balance in favor of thinning per tree, taking picked apples $2.69

Deduction due to loss in total crop from thinning (as shown) .... .94

Real increase in value from thinning per tree.......... 1.75

Taking 20 bearing trees per acre per year the increased value from thinning 1 acre is........ $35.00

The price per barrel as given in foregoing table was the average price obtained by the United Fruit Companies of N. S. Ltd. for their first cargo of Gravensteins shipped to England.

THINNING FRUIT AT BRIDGETOWN—1914.

Gravenstein trees uniform in set of fruit were used. 12.1 per cent of apples were removed the latter part of July. The picked fruit from the unthinned trees averaged 2,658; the thinned, 2,328 apples per tree. The number of apples removed from the thinned trees averaged 321 per tree. The unthinned trees gave 443, the thinned 388 apples per barrel per tree run. The results were as follows:

	Unthinned.	Thinned.
Per cent No. 1 fruit	77.88	89.29
Per cent No. 2 fruit	12.93	6.60
Per cent No. 3 fruit	6.39	4.11
Per cent Culls	2.80	

Nonpareil trees uniform in size were also used in a similar test, 17.4 per cent of the apples being removed early in August. The picked fruit from the unthinned trees averaged 2,492; the thinned, 2,668 apples per tree. The number of apples removed from the thinned trees averaged 562. The unthinned trees gave 667; the thinned, 623 apples per barrel, tree run. The cost per tree for thinning was 25 cents. The results obtained were as follows:

	Unthinned.	Thinned.
Per cent No. 1 fruit	50.39	59.02
Per cent No. 2 fruit	32.42	26.69
Per cent No. 3 fruit	10.15	14.29
Per cent Cull	7.04	

In connection with the thinning work, some one will say it is a big expense. The expense of thinning is not so very great after all. We figure on about 25 cents per tree, that is, on trees about twenty to thirty years old. You will be surprised to learn how rapidly a person used to it can go over the trees and remove the fruit. To remove this fruit amounts to about $10.00 an acre, figuring it at 40 trees to the acre. The cost of thinning is more than offset by the ease in packing your fruit at harvest time. If you have a large percentage of No. 2 or No. 3 to go through to get your No. 1 fruit, you can readily understand that you must of necessity take more time in order to get your grading done. So that we find the cost of thinning is more than offset by the increased ease with which the packing can be done after the fruit goes into the packing house. I do not know that it is necessary to spend any more time on this phase of the work that we are following out, I just bring it to your attention because it is one of the things lost sight of by our growers and possibly by some of your growers. I wish to take this opportunity of impressing upon you that in the production of your box fruit, you must practice thinning more or less in your orchards if quality is to be obtained and it is quality that pays.

Question: What time do you recommend doing thinning?

Prof. Blair: When the apples are about the size of a crab apple or possibly a little smaller; some say about the size of your thumb. Of course crab apples are different sizes, but a medium sized crab apple. We have generally a considerable drop along in July. We wait until that is over, then start in on our thinning work. There is an advantage in leaving it just a little late in that you can tell better what fruits will be best to leave on the trees. They form up a little and any fruits that are going to be deformed you can readily detect at that time. On the other hand it is not advisable to leave it too late, because you take a certain amount of energy from the tree. The nourishment required to produce that fruit and carry it along to a certain point, would be wasted, while it would go into the remaining fruit, if the fruits were removed earlier. Our thinning is usually done in the latter part of July. I would say that possibly about the 15th of July would be the time that thinning could be practiced here to advantage.

Question: What distance do you advise thinning out fruit? That is, how near together is it advisable to leave it on the trees? You spoke of two, four or six inches?

Prof. Blair: That is a thing that is very difficult to work out,—the distance at which you should thin your fruit. It is a question that the fruit grower must work out, like his fertilizing problem, for himself. Condition of his soil, cultivation given, set of fruit and vigor of trees, all must be taken into consideration. It may be possible that he could thin to eight inches apart and do it profitably, while his neighbor under other conditions could not do so. I would say as a general thing that the first thing for a fruit grower to do would be to give what we call a general thinning, that is, removing deformed fruits, removing any fruits that have been punctured by insects or injured by insects in any way, or which have any sign of scab; also where there are two or three apples in a fruit cluster, removing to one. That is what I would suggest for the grower, and then he can follow on from that, thinning more vigorously if he finds it profitable. In any case I would not advise thinning over about six inches under average conditions even for the large apples.

Question: Have you found serious difficulty in fruit becoming too large in any season?

Prof. Blair: Yes, there is a possibility of that. A great many of our markets, especially for some varieties that we have, prefer for the table moderate sized apples rather than very large ones and in cases where we have high cultivation we have to be careful not to get abnormally large apples, as we would were too severe thinning practiced. So there is another case where the grower must take into consideration the soil condition in determining how far he can go with his thinning with profit.

There are a number of things which we are trying to do in connection with our work, some of which may be of interest to you. I did some work a few years ago when connected with the experimental farms before I went to MacDonald College in the province of Quebec, which I think did more to impress upon fruit growers the importance of cultivation and the value of moisture than anything else that has been done. In fact, we can trace back now through our old fruit meetings the gradual development of the orchard cultivation system as practiced through the valley largely from that point. The farmers could see at once that moisture, through the proper cultivation of the soil in the early spring, played an important part in the successful maintenance of the orchard. In connection with that work certain plots were laid out, and soil samples were taken to determine the percentage of moisture in the soil at different periods during the summer time. The following table gives the results of some of these experiments.

SEED MOISTURE TESTS WITH COVER CROPS.

Date when samples taken.	Winter rye.	June 20 oats seeded.	Clean culture.	July 25 seeded to crimson clover.	Seeded to red clover previous year.	Rainfall for. Inches.
May 12.....	18.41	20.00	18.09	20.88	18.93	
May 26.....	17.21	18.02	18.43	21.21	18.97	May .68
June 9.....	12.52	17.84	19.24	20.31	14.04	
June 23.....	10.46	17.40	17.71	20.46	11.65	June 2.29
July 7.....	9.06	16.70	17.46	19.14	11.22	
July 21.....	7.46	13.43	16.35	20.54	12.06	July 2.07
Aug. 4.....	8.23	9.49	15.10	18.11	10.36	
Aug. 18.....	9.80	10.30	15.71	20.26	13.66	Aug. 2.40
Sept. 6.....	17.79	16.99	20.13	24.04	20.22	
Sept. 20.....	14.91	16.31	17.99	18.09	19.87	Sept. 3.63
Oct. 31.....	21.33	19.77	21.42	26.02	19.71	Oct. 5.78

SOIL MOISTURE TESTS WITH COVER CROPS.

Date when samples taken.	May 23 seeded to oats.	Seeded to red clover previous year, cut July 20.	Seeded to red clover previous year, cut and left for mulch June 16.	Crimson clover seeded June 15.	Crimson clover seeded July 20.	No cover crop. Not cultivated after July 20.	Rainfall for. Inches.
May 15......	17.40	16.04	17.33	16.50	16.28	17.76	May 3.02
June 1......	16.37	14.23	13.83	15.25	16.97	14.74	
June 16......	15.54	14.88	15.94	16.19	15.78	18.02	
June 29......	16.30	19.06	18.52	17.50	17.97	17.92	June 3.30
July 17......	11.02	8.08	11.77	13.89	15.65	14.59	July 1.56
Aug. 2......	5.63	7.26	7.12	9.73	15.50	15.02	
Aug. 15......	5.17	5.91	5.64	7.87	14.11	14.03	
Aug. 30......	5.01	4.17	4.37	5.26	9.97	14.36	Aug. 1.53
Sept. 18.....	12.66	10.52	12.58	11.47	14.68	16.31	Sept. 3.38
Oct. 3......	11.22	9.05	10.61	9.24	12.67	13.06	
Oct. 18......	9.34	6.71	8.01	6.69	9.44	11.34	Oct. 1.29

The idea that this little experiment conveyed to the fruit growers was that certain crops took a large amount of moisture from the soil, hence it left the soil so the apple tree could not get the moisture it required. On the oat plot it will be seen that during the first part of the season there was 20 per cent of moisture. The moisture content went down rapidly until on August 4 there was only 9.49 per cent of moisture; just at the time when the apple tree was making the greatest drain upon that soil of moisture and when the greatest evaporation was going on from the tree, when the tree could withstand the effects of the drought less than at any other time. The soil had no moisture in it for the very reason that the crop of oats which had been planted in the orchard had taken the moisture up and thrown it off into the air, hence causing injury. Now a clean culture plot right along side of this, where the ground was kept cultivated as we know we should keep our orchards cultivated in the early part of the season, followed by a cover crop, had at the same date fifteen per cent, a gain of five per cent. The difference between ten per cent and fifteen per cent was favorable to the tree's getting the moisture supply required to carry it along and to make use of the plant food in the soil at that time, whereas the other condition did not favor growth for the simple reason that there was not a sufficient amount of moisture there for that purpose. This work was followed up on clover plots; that is, clover which had been seeded the previous year—a practice followed by a great number of our growers—was allowed to grow to find out what effect it would have in drying out the soil. A great number of our growers follow this practice, letting their clover grow in the spring time and run along until the latter part of May and June and then plough, which is a very bad practice. We found that whenever clover was growing the middle of July there was only 11 per cent of moisture. The effect of this, then, has been that the fruit growers have avoided the spring clover crop in their orchards—not allowing it to grow in the spring time—and have come back to the system of cultivating, working up their ground early, and then have followed with their clover or vetch cover crops so as to withdraw, if necessary, the moisture towards the latter part of the season. The date to sow these cover crops has been worked out to a greater or less extent. For instance, crimson clover sown on the 15th of June, compared with that sown on the 20th of July, shows that the soil moisture content went down to 9.73 per cent against 15.50 per cent where sown later, indicating that it was possible for the fruit grower to sow his cover crops too early; also indicating that if the fruit grower wished, he could, by the manipulation of his crops, dry out his soil at certain periods and in that way check his tree if he thought it desirable to do so, hence possibly get a better color of fruit, as we sometimes think does obtain if a certain check is given to the tree at a certain time toward the latter part of the season.

I will not dwell on these experiments any longer, except to point out this,—that in work of this kind you have something definite and accurate that assists the grower, and something that he must have in order to follow out what we consider up-to-date practices. It is no use for me to tell the farmer that an oat crop will take so many pounds of water from the soil in a certain period, or that the crop will be lessened by the growing of a certain grain crop or grass crop in the orchard. But we must get at it from the standpoint of the moisture content to show that the tree must have a certain quantity under certain conditions in order to make use of the plant food that the soil does contain.

In connection with the planting of young trees we tried some experiments for the purpose of finding out whether it was desirable or not to use fertilizer of any kind when the young trees were planted. Probably some of you growers have, when setting a tree, put a handful, or two or three, of fertilizer around the young tree after the tree had been planted, or possibly thrown it in when the tree was being planted. I wanted to find out whether it was possible to injure a young tree because I knew this practice was followed by growers. A great many of our people take a small bag of fertilizer, and think that in planting a tree, two or three handfuls thrown around it will just send it right along. This work was followed at the rate of from 600 pounds to 3000 pounds per acre, applied around the tree at planting time. The work was duplicated by mixing this quantity of fertilizer with the soil dug out for planting the tree. We found the first year that in every case where the larger quantity was used there was lessened growth, and that the check plots on which there was no fertilizer at all, made a better growth the first year than where the fertilizer was used. Where we used a moderate quantity of fertilizer, 600 pounds to the acre, the trees made growth somewhat similar to the trees alongside which had not received any fertilizer at all. And even where the manure was used around the trees the growth was not as good as where the manure was not used. Of course good cultivation was given.

Question: What was the condition the second year?

Prof. Blair: I am coming to that—dealing with the first year first. On the trees where the manure was worked into the soil before the soil was put around the trees, the results were not as good as where the manure was put on the surface and worked in. Also, the fertilizer put upon the surface and worked in to a depth of three inches did not cause the damage to the young tree that the fertilizer did where it was mixed with the soil thoroughly into which the tree was planted.

The second year we expected to see something a little more definite, but after making careful notes of the four varieties we had under test, and taking measurements at different places, we found that there was little difference in all the trees to which the fertilizer was applied, except that where the 3000 pounds was used the growth was not quite so good as when from 600 to 3000 pounds was used.

Question: You mean 600 pounds to 3000 pounds on little trees as you set them out?

Prof. Blair: At that rate per acre.

Question: Yes, but that is an enormous amount. How did you go to work to apply so much?

PROF. BLAIR: We find lots of fruitgrowers in our section who will take two or three handfuls of fertilizer and scatter it around the young trees. They do not realize what a quantity they are putting on. One ounce of fertilizer to a square yard is equal to 300 pounds per acre, so when you take a handful of fertilizer, you are not applying it at 300 lbs. per acre, but usually at the rate of 1500 to 2000, in some cases 3000 lbs. per acre. What I was getting at in connection with this problem was to find out whether an injury did result from this application, and whether that was a waste of material or not. The results would seem to indicate that in the planting of young trees, if you have conditions right for the tree other than plant food, you need not necessarily pay very much attention to the plant food requirements.

Question: About how many pounds of fertilizer would that mean on an actual acre of orchard?

PROF. BLAIR: At the rate of 2,000 pounds per acre the quantity of fertilizer actually applied by the acre of orchard would not be very great. In the planting of young trees we will assume 40 trees to the acre, each to occupy one square yard, and one ounce to each tree represents at the rate of 300 pounds per acre, or 40 ounces on the acre which would not be a very big expense; but it is not so much a case of saving, it is the energy used in putting that fertilizer there and whether there is any benefit derived from it, and whether 1-2 lb. to the tree or at the rate of 2400 pounds per acre will do more injury than it will good.

BEE KEEPING AND ITS RELATION TO FRUIT GROWING.

O. B. GRIFFIN, Caribou, Maine.

It is not my purpose at this time to deliver an address which may be considered the last words on the subject, or to go into the technical side of the question in a way that, perhaps, neither you nor I would fully understand, nor shall I attempt to go into details in fruit culture as there would hardly be sufficient time to discuss the subject of fruit growing and bee-keeping in this way, to much profit.

While the growing of fruits and flowers has always possessed much of interest to me, and I have received in the pleasure derived from their culture, even in a small way and in a careless manner, much more than the effort cost me, I am not able to cite instances in my own experience in many cases but must depend on those attained by others.

While I feel as do most Aroostook people, I think, that my lot has been cast "in pleasant places," in one of the best counties in our peaceful nation, yet at times, yes, many times, I have felt the call too strong almost to be resisted, to emigrate to central or southern Maine or some other fruit belt and take up the growing of fruit, in connection with bee-keeping, as a vocation. I can hardly imagine an occupation that would return larger profits in health and happiness, and insure, if managed in a business-like manner, a comfortable income, at least. What more could one desire than this?

I want to digress from my subject a little, right here, to say that it has seemed to me that the men in Maine outside of Aroostook county, who have good orchards or land suitable for orcharding, and have neglected this branch of farming to take up potato growing, are making a mistake. There are exceptions, of course. The man who has no liking for an apple tree or bushes that bear fruit, is doing right, I think, to leave their culture alone and take up something more to his liking. But I believe this,—that the same amount of effort expended in growing and properly marketing apples in Maine, outside of Aroostook, will bring larger cash returns and much more in real pleasure and peace of mind, than will the growing of potatoes.

I realize that with the conditions existing this year, most of you no doubt feel somewhat discouraged with apple growing, but I can assure you there are few potato growers getting rich. I am inclined to the belief that one of the great needs of the apple grower in this state is better facilities for storing and holding the crop and putting it on the market when it will bring paying prices, rather than to be forced to market it in the fall or early winter at a much less margin of profit. There will be many barrels of apples in this state this year that will go to waste, no doubt, that could be marketed if the proper machinery could be set in motion to reach the would-be consumer.

In my own county there is nearly always a surplus of fall varieties of apples. Some years barrels of them decay on the ground, but it will not be very long, even this year, before we will be paying five cents apiece for apples grown on the Pacific coast, that are not a whit better, if as good, as a properly grown Maine Baldwin, Northern Spy, Black Oxford, Nodhead or several other varieties that could be mentioned.

I only speak of these things at this time, or of this side of the question, to encourage you and possibly to enthuse some of you to reach out after better things that are within your reach; and to possess a confidence in the business of fruit growing.

Possibly many of the apple growers of this state might learn a profitable lesson from the Aroostook potato grower. They are looking ahead through the coming years, expecting to grow potatoes and planning how they may grow better potatoes and grow them more cheaply. Different political parties may overhaul the tariff, or other issues may arise, but the average potato grower maintains or increases his acreage. But gradually the potato grower is realizing that he is neglecting the vital end of the business, the marketing of the crop when grown. And I am inclined to the view that the apple grower could profitably pay more attention to the marketing of his crop.

But I am getting away from my text, "The Honey Bee and Its Relation to Fruit Growing."

When first we are told that flowers are of two kinds, the staminate and pistilate, or male and female flowers, and that the pollen, the fine flour-like substance clinging to the blossoms, is the fecundating or life-giving properties of plants and must be carried from one flower to the other by some agency, before the plant or tree can fruit or bear seed with which to reproduce itself, we are filled with a feeling of awe and admiration for the Great Creator's handiwork.

When we partake of the sweets which the industry of the honey bee, coupled with our own care and planning, has made possible, we are apt to lose sight of the prime purpose of the creation, no doubt, the fertilizing of fruits and flowers.

There are other agencies beside the honey bees which carry out this end, or at least play an important part. The wind is an important factor in distributing pollen, and in some cases may be sufficient, while with flowers having a very deep calyx, as the squash, pumpkin or melon and cucumber, the need of some other agency is apparent.

When the growing of cucumbers was undertaken under glass, it was necessary for some one to take a fine brush and go among the vines, touching first one and then another of the flowers, until the vines had all been gone over. This had to be repeated every few days through the blossoming season to insure a profitable crop. Eventually some enterprising fellow, who may have been a trifle lazy, or did not like his work, conceived the idea of putting in a colony of bees and lo! this thing was accomplished much better and far cheaper than could be done by human hands.

There are in nearly all countries some wild bees that to a greater or less extent, perform the office of carrying pollen. Even in our own state where there are many hindrances to the wild bees, in our unfavorable weather conditions, in some years we receive nearly full crops without the aid of the honey bee in large numbers.

The honey bee is the natural accompaniment of civilization. With the increase of population came the naturally increased demand for fruits and the destruction of the forest, the natural protection of wild bees and pollen carrying insects.

Thirty to fifty years ago, the bumble or *humble* bee was found in large numbers in most parts of the state. Today there are but few, except in some favored localities. In the early days of Aroostook county the growing of red clover seed was quite an important industry and quite a profitable one. For several years past this has not been a profitable crop, as the heads do not mature enough seed for a paying crop. And it is the lack of these humble insects, the humble bee, which is very largely if not entirely responsible for the difference of three and four hundred pounds of seed per acre thirty-five years ago and one hundred pounds or less, which may be secured today.

Several decades ago the growing of red clover was tried in New Zealand and the plant was found to thrive splendidly, but it produced almost no seed. Scientists took up the matter and bumble bees were imported from the United States, through our Department of Agriculture. As soon as they had time to multiply, which they did quite rapidly under their favorable climatic conditions, good crops of seed were secured.

The tube petals of red clover are so deep that the honey bee is not able to secure much nectar from the blossoms, except in years when drouth or other conditions caused them to be shorter or the nectar being more abundant, they are able to work on it to advantage. Consequently the blossoms are not visited by the honey bee to any extent, causing a lack of pollination.

While the apple grower may secure a paying crop of fruit without the presence of honey bees, some years, there are other years when, with a full bloom, little fruit is set. Many times, had bees been present in sufficient numbers in those off years, a paying crop would have matured. With a favorable winter and spring, wild bees and other insects will be quite plentiful and assist largely the work of pollination in the orchard. In other years, there are too few to be of importance.

The honey bee, if the colony be strong, will fly out and visit the blossoms in search of nectar. When the days are cold, little nectar is secured, but the purpose of pollination will be accomplished. It is, therefore, of importance that colonies be kept as strong as possible if the best results are to be attained in the pollination of the blossoms, and of equal importance in securing a crop of honey.

To have strong colonies in early spring, we must have the right conditions for wintering,—suitable stores and plenty of young bees when they go into their winter quarters.

In the buckwheat sections of New York, a few years ago a man went to his neighbor, one of the most prominent bee-keepers and a well-known authority on bees and subjects pertaining thereto, and told him he thought he should be willing to pay him in honey for the pasturage furnished by his large buckwheat fields. Somewhat to his surprise, his neighbor readily agreed to do this and they settled on a certain number of pounds of honey per acre. "Now," said the bee-keeper, "you are a fair-minded man and I feel that you are owing me quite a little sum of money or several bushels of buckwheat." The man asked for an explanation. Said the bee-keeper, "You tell me your crop averaged you some thirty-six bushels per acre; the average for the state is less than twenty. In sections a few miles from here where you admit the soil is as good and the farmers as thorough as yourself, but where no bees are kept, the average has been about sixteen to eighteen bushels per acre. In every locality where bees are kept in any numbers in this state, the results are practically the same."

As the comparison was much in favor of the bee-keeper the man said, "I think I had better call the account balanced if you are willing." The bee-keeper assured him that he was willing, but insisted that he take a case of honey home without cost to him and told him an honest understanding of things always made better neighbors and friends.

I will cite a few instances of the value of bees in the orchard and I assure you it is my honest opinion that the honey bee is of much value to the fruit grower, whether of tree or bush fruits. While the strawberry furnishes little, if any, nectar, the bees work on them for the pollen and are of much value.

That well-known orchardist, J. L. Van Rensselaer, in 1912 rented an old orchard in Ohio, of fifty acres, which was returning little profit to its owner. With thorough pruning, cultivating, spraying and fertilizing. he secured in 1913 a large crop of nearly perfect apples. He attributes much of his success to the placing of fifty colonies of bees in the orchard previous to the blossoming season. He desired more bees but could not readily secure them and thinks the crop would have been much larger had he had twice the number of colonies.

Prof. A. J. Cook, Professor of Entomology, in 1891, at the Michigan Agricultural College, said:

"I tried many experiments last spring. I counted the blossoms on each of two branches, or plants, of apple, cherry, pear, strawberry, raspberry and clover. One of these in case of each fruit, or each experiment, was surrounded by cheese-cloth, just before the blossoms opened, and kept covered till the blossoms fell off. The apple, pear and cherry were covered May 4, and uncovered May 19 and May 25. The number of blossoms considered varied from 32, the smallest number, to 399, the largest. The trees were examined June 11 to see what number of the fruit had set. The per cent of blossoms which developed on the covered trees was a little over two, while almost twenty per cent of the uncovered blossoms had developed."

J. F. McIntyre was a delegate at the California State Fruit-growers Association for 1893 and reports:

"A gentleman stated that he had a friend in this state who started into fruit growing several years ago, locating thirty-five miles from any fruit growing section, or where any bees were located. The first year that his trees blossomed, when he expected at least some returns from his orchards, what should be the result but complete failure? He was advised to procure some bees to aid in the fertilization of the blossoms. He did so, and since then his orchard has been productive."

C. J. Berry, one whose fruit orchard contains 440 acres and who is horticultural commissioner for Tulare county, Cal., an inland county that has made great progress in the fruit-industry, gives this valuable testimony:

"Bees and fruit go together. I can't raise fruit without bees. I have bees all about my big orchard. Two years in succession I have put netting over some limbs of trees; and, while they blossomed all right, nary fruit; while on the same tree, where limbs were exposed to the aid of bees, plenty of fruit."

Again, Chas. A. Green, for the Fruit Grower, published in Rochester, N. Y., writes:

"It has now become demonstrated that many kinds of fruits, if not all kinds, are greatly benefited by the bees, and that a large portion of our fruit, such as the apple, pear and particularly the plum, would be barren were it not for the helpful work of the honey bee. This knowledge is largely owing to the discovery of Prof. Waite of the Agricultural Department at Washington."

At a joint meeting of the National Pomological Society and the National Beekeepers' Association, occurring on Sept 12, 1901, at Buffalo, a number of valuable papers were read, all of them testifying to the invaluable office of the bee in pollinating fruit blossoms. Space will permit us to give only two references. Prof. James Fletcher, of the Ottawa Experiment Station, among other things, said:

"It will be found that not only are flowers absolutely necessary to bees as the source of their food—nectar and pollen—but that bees and other insects are no less necessary to most flowers, so that their perpetuation may be secured.

"The fact should be recognized by the fruit grower above all others; for were it not for insects, and particularly for the honey bee, his crop of fruits would be far less than they are every year, and even in some cases he would get no fruit at all.

"Failure in the fruit crop is more often due, I think, to dull or damp weather at the time of blossoming, which prevents insects from working actively in the flowers, than to any other cause."

At the same joint meeting of bee and fruit men, H. W. Collingwood, editor of the Rural New Yorker, one of the best and most reliable agricultural papers, said:

"We can easily forgive the bee his short working days when we consider the good he does. There is no question about the debt fruit-growers owe him. People talk about the wind and insects in fertilizing our flowers; but I am confident that any man who will really take the time and pains to investigate for himself will see that the bee is nearly the whole story. I have seen the certain results of his good work in a neighbor's orchard. Those bees 'broke the trees' down just as truly as though they had climbed on the trees by the million and pulled at them. The appearance of those trees after a few years of bee keeping would have convinced any fair-minded man that our little buzzing friends are true partners of the fruit grower."

Prof. Bailey, the very able horticulturist of Cornell University, says "bees are much more efficient agents of pollination than wind, in our fruits, and their absence is always deleterious."

If bees are then of so much value in fertilizing the blossoms, the fruit grower should welcome the bee-keeper and protect the bees.

It has been proven, I think conclusively, that there is nothing to be gained by spraying fruit trees while in bloom, and often they are injured and the crop diminished.

The orchardist can accomplish what he desires by thoroughly spraying just before the blossoms open and after the flower petals have fallen and he will not destroy the bees which are his best friends.

A sweetened poisonous spray would be dangerous to use at any time, particularly so at a time when nectar was not plentiful in the fields. In times of drought bees will take up spray that is not unpleasant to their taste for the water it contains, though it is a question if much harm is done in this way.

Bees are sometimes accused of injuring fruit by puncturing them to get the juices. This, however, bees are unable to do.

They will work on fruits that have been punctured by birds, wasps or other insects or on decaying fruit late in the season when there is no nectar to be found in the natural sources of the flowers.

I have crushed bees when they were at work on over-ripe raspberries and found the honey sacks filled with the red juice of the berries. They will not trouble berries so long as they are firm and in a marketable condition. The small fruit grower need feel no anxiety even when bees are quite numerous in the fruit patch. They will not sting at such times unless they happen to be accidentally jammed when picking the fruit. If they seem at times to be something of a nuisance, remember they have no doubt increased your crop many quarts. The grower of small fruits, both the bush fruits and strawberries, needs the bees among the blossoms to fertilize them and cause them to fruit fully as much as, if not more than, the apple and pear grower.

Many would like to keep a few colonies of bees in the orchard but feel that they have not the time or inclination to care for them.

The purposes of pollination may be accomplished and considerable honey secured in the following manner:

Provide several hive bodies, duplicates of the one in which the bees are hived, and as the season advances, add the extra hives, one at a time as needed by the bees. If it is desired to use the honey in the comb as chunk honey, the frames in the hives above the brood chamber proper should not be wired and strips of thin foundation should be used instead of full sheets of brood foundation. If it is to be extracted, full sheets of foundation and wiring are advisable.

If the extra hive bodies are added at the proper time before bees are crowded there will be little trouble with swarms and at the close of the season, or before being prepared for winter, the extra hives may be removed and extracted or kept in a warm, dry place until the honey is used or sold. The honey can be cut from the frames as chunk honey and sold to near-by customers. The price realized will not be as much as is paid for honey in sections, but more can be secured and it would not cost the bee-keeper as much per pound. The frames in which much brood has been reared may be saved intact and used as needed by the bees in early spring or as additional winter stores. If an eight frame hive is used, it will be best to have two of the hive bodies reserved as the brood chamber.

I would prefer a ten frame hive, though, to use in this way. The hives may be packed inside a winter case surrounded by leaves or other dry material, for winter, or carried to a dry under-ground cellar where an even temperature may be maintained and light, mice and rats excluded.

If one wishes to keep a larger number of colonies and sell honey to the trade it will be almost a necessity to adopt some style of hive adapted to the production of comb honey in the small wooden boxes called sections of which there are several styles. It will be better to decide on some one style of section and then have all hives and fixtures alike, as several styles of hives and sections in the same yard are a nuisance at best. It is largely a matter of individual taste, or local demand, which style of section you adopt. The standard section most in use is four and one-fourth by four and one-fourth by one and seven-eighths inches; and where separators are used, as is necessary if honey is to be cased, it will hold about one pound. The plain section $4\frac{1}{4} \times 4\frac{1}{4} \times 1\frac{1}{2}$ or $4 \times 5 \times 1\frac{3}{8}$ used with a fence will contain about the same amount of honey, but the honey will be filled nearer to the edges of the wood and sometimes will be attached to the fence, so as to make a broken surface and often leakage when removed from the supers. In casing to put on the market one must be a little more careful in handling than where a bee-way section is used. Some think the plain section when filled makes a more attractive package and rather a better seller, but this is lost when honey is sold in cartons.

Too much cannot be said in favor of the use of the carton for each individual section of comb honey. Honey must be eaten just as it is taken from the bees. It cannot be washed or cleaned if soiled by contact with dust, flies or other dirt to any advantage without detracting from its appearance and that is what we buy comb honey for. If it does not appeal to the eye we may as well buy extracted honey. The day when comb honey can be exposed on the grocer's counter or shelves for days and then sold is largely of the past. To be sure, comb honey can be handled and taken to the consumer in as nice condition as in cartons, but is not apt to be so. In my own practice, the honey is removed from the hive in the supers and tiered where flies or dust cannot reach it. When removed from the supers each section is scraped to remove the most of the propolis, which gives it an untidy appearance, to say the least, and it is at once placed in the paper carton which insures its reaching the customer in as cleanly condition as possible.

If the taste of the bee-keeper, or the market he expects to cater to, prefers extracted honey, the bees may be run for extracted or part comb and part extracted, if the apiarist desires. One must be governed by taste and local or market conditions in deciding which to adopt.

Sometimes the sources from which the honey are gathered are such that comb honey of good appearance cannot be secured while the quality of the honey secured may be very good. In such cases I think it better to work for extracted honey. More honey can be secured in this form, as when the combs are once built they will last for years in good care and in a good flow will be filled very rapidly, while in comb honey production the comb must be built new with each pound. In working for extracted honey, the same style hive may be used except that the super arrangement must be different. Instead of a super case or frames for holding section, half depth frames are usually used and the frames built full of comb.

In comb honey production it is most important that the bee-keeper possess a knowledge of the sources from which he hopes to secure a crop of honey, as a lack of this knowledge may lose for him a large part of the crop, or the season may close, leaving a large part of the honey crop in an unfinished condition. The production of honey, either comb or extracted, fits in nicely with fruit growing, with the exception of strawberries. The picking season and the swarming season with the bees come at nearly the same time and mean a great deal of work for the bee-keeper unless he can be sure of plenty of good help.

In the production of either comb or extracted honey it is of the greatest importance that we have strong colonies of bees of the right age at the right time. To have these conditions we must prepare for them sometime ahead. The season before we hope or plan to harvest a crop of honey we should see that all colonies are in good condition, that is, with suitable hives, plenty of good stores for winter, and a prolific queen, a young queen preferred in each colony. Then if we provide suitable quarters in which to winter the bees, whether out of doors or in the cellar, we have done our part toward this desired end.

There are several races of bees of which the Italian bee, first imported from Italy, but now bred and kept extensively in this country, is probably the best known and most popular. For the purpose of pollination in the orchards in this state, or for the production of comb honey, I would prefer the Carniolans or our common black or German bee. If working for extracted honey, especially in a locality where a late flow could be expected such as from buckwheat, for instance, perhaps the Italians would be the better bee. In two years' experience with Carniolans I find they winter well and build up rapidly even under adverse spring weather conditions if they have plenty of stores and hives. For purposes of pollination in the orchards of Maine these qualities are valuable and we cannot get strong colonies any too soon, to secure the best results in the production of honey.

FERTILIZERS FOR THE APPLE ORCHARD.

Prof. C. A. McCue, Newark, Delaware.

During the past few years there has been a rather sharp controversy going on among horticulturists regarding the advisability of using commercial fertilizers in the apple orchard. One class contends that it is seldom necessary to apply commercial fertilizers, while another school has insisted that their use was justified. During the past seven years the speaker has had considerable experience with the use of commercial fertilizers in orchard work, although it is to be confessed that this work has been carried on with peach trees more than with apple tıees. The peach is more sensitive than the apple to changes in food, climate, and method of cultivation. Yet in all probability, the fundamental principles underlying the use of commercial fertilizers for the peach orchard are approximately the same as those in the apple orchard. My stand on the much debated question of orchard feeding is that both sides are more or less justified in the course they have followed. This seemingly paradoxical statement is not as bad as it sounds, and I will attempt to make my position clear to you as the subject is developed.

In profitable fruit production, there are many factors that have to be taken into consideration. No one factor is alone responsible for success, although it may be that the absence of one necessary factor may account for failure. Many men are apt to over-emphasize one factor and neglect another. One man may devote all his energies to successful spraying, another to cultivation, yet both may be successful apple growers. Each of these men will have his theory about the proper way to treat an apple orchard and insist that the other fellow is wrong. The man who practices the sod mulch system cries aloud, that all may bear, that sod mulch is the best way to handle an orchard; another one says that cultivation is the only way, and straightway they fall to arguing as to which is right. They fill the air with words and the Experiment Station bulletins and farm papers with printer's ink, neither recognizing that under certain conditions they may both be right. In general, they overlook the fact that moisture is the key note to both their methods. The sooner orchardists and experimenters learn to stop generalizing from the behavior of certain pieces of orchard land under their immediate supervision, the sooner will we have safe and sane methods of orchard culture. Personally, I am a great believer in the "clean-culture cover-crop method" of managing an orchard, yet I recognize the fact that there are many thousands of orchards that can be more profitably and economically handled under the sod mulch system. It is largely a question of water and plant food. It has been my experience both through experimentation and observation that the two great limiting factors in fruit production are moisture and nitrogen. Yet this is not necessarily always the case.

Perhaps at this point, I can do no better than spend a few moments in discussing the so-called law of the minimum. Roughly expressed, it is that no plant can prosper beyond a certain point which is defined by the available amount of all of the factors necessary for its full development. If any of these factors be deficient the plant can prosper only so far as this factor is present. For example, in plant growth there are about thirteen plant food elements necessary for proper development of the plant. If one of these, say iron, is deficient in the soil, the plant can develop only so far, regardless of the fact that all other food elements may be present in excess. In general, the law of the minimum holds that in order to grow at all, plants require certain minimum amounts of certain factors. As the amounts of these factors increase, so also the growth of the plant progresses up to a more or less definite point known as the optimum. Any further increase of the factors causes a decrease in growth. All plants increase in growth until the optimum of all necessary factors is reached. Thus we can see that trouble in plant production may arise from too much of any one factor as well as from a deficiency of a factor. For example, there is an optimum amount of soil moisture needed for the best development of plants, yet the plant may suffer severely from either drought or an excess supply of water in the soil.

Plant food represents a certain set of factors that are necessary in the proper development of apple orchards, yet plant food is not the only requirement. We need a proper moisture supply, proper pruning, and proper protection against the ravages of insects and fungus diseases. Above all, we should remember that the limiting factors in one orchard may be entirely different from the limiting factors in another orchard. In some sections of the county, a certain factor, say potash or phosphoric acid, or even lime, may be deficient over a large area. In my own section, the limiting factor in the soil for many crops is phosphoric acid, yet phosphoric acid does not appear to be the limiting factor in apple production in that section. One orchard's food may be another orchard's poison.

A large number of experiments in orchard fertilization have been carried on in the United States, yet only a very few of these experiments have been fundamental in principle or of more than local value in their significance. Reports have been made upon only five that have been carried on for a long period of years. There are others that are under way that show promise of ultimately throwing light upon the vexatious problem of orchard fertilization.

One of the most noted of these long time experiments is one being carried on by the Woburn Experiment Station in England. This experiment began in 1894 and is still in progress. In general, this experiment shows but little if any benefit from the application of either barnyard manure or commercial fertilizers.

These results show that plant foods are not the limiting factors in apple production in this particular orchard.

In 1907, a report was made upon an experiment in fertilizing apples at the New York Station. This experiment had been running for twelve years. The fertilizers used were wood ashes and acid phosphate. Here again the results were considered negative, having barely paid for the cost of the fertilizers. Yet a close scrutiny of the figures from this experiment reveals a rather peculiar state of affairs. In the plots under treatment there were five varieties of apples used: Baldwin, Fall Pippin, Rhode Island Greening, Northern Spy and Roxbury Russet. While the combined yields of all of these varieties show but little benefit from fertilizers, the results obtained by considering the varieties separately show that there was a striking difference in the response of the different varieties. Baldwin and Rhode Island Greening made practically no response to fertilizer applications, while Spy and Roxbury Russet showed an annual average gain of 125 bushels per acre. This offers startling proof that the limiting factors for one variety of apples may not be the same for another variety. No nitrogen was used in any of the treatments, hence we have no proof but that a nitrogenous fertilizer might have proved of great benefit to this orchard.

A third experiment is one that has been carried on since 1889 by the Massachusetts Experiment Station. This work was reported upon in 1911 by Director Brooks. The fertilizers used were bone and muriate of potash, wood ashes, bone meal and sulphate of potash, and barnyard manure. In growth of tree, as represented by the circumference of the butts, the greatest results were obtained from barnyard manure. Trees in this plot had increased in circumference about 11 inches more than the trees which had received no fertilizers. The next best gain was made by the use of bone and sulphate of potash. Considering all varieties, the results being for an average of 20 years, the treatments yielded as follows:

No fertilizer	88	bbls.	per	acre
Wood ashes	286	"	"	"
Bone and muriate of potash............	322	"	"	"
Bone and sulphate of potash...........	488	"	"	"
Barnyard manure	556	"	"	"

The largest fruits have been picked from the treatment receiving bone and sulphate of potash and the smallest from the plot having had no treatment. The best colored fruits have been found on the wood ashes plot and the poorest colored from the no treatment plot. Director Brooks says: "On the plots having barnyard manure, the fruit has been coarse and ill looking and does not sell well, while that on the wood ashes plot is of extra fine color and appearance and is in great demand."

One of the most interesting points brought out in the Massachusetts experiment is the difference in results between the use of muriate and sulphate of potash, the sulphate giving much the better results. This superiority of sulphate might be attributed to the magnesia in the sulphate or to the bad effects of the chlorine accumulating in the soil from the continued use of muriate.

This experiment has shown without a doubt that on this particular orchard, fertilizer applications have been of great benefit. However, the fact should not be lost sight of, that this was an uncultivated orchard and that the presence of grass growing in the orchard may have profoundly modified the results. In testing fertilizers in orchards, one should make his tests on trees alone and not upon trees and grass. That is to say, experimenters who are searching for fundamental facts in orchard fertilization should not hamper their results by using orchards in sod. The farmer who finds that the sod mulch system of orcharding is the most economical one for him to follow is perfectly justified in using fertilizers as a top dressing in his endeavor to find the plant food deficiencies in his orchard.

The New York Geneva Station has also reported upon another experiment in fertilizing apple orchards. This experiment is unique in that all trees involved in the test were of one variety and all had been budded from the same parent tree. The variety used was Rome Beauty top worked upon Northern Spy stock. Here again, the Geneva Station reports negative results from the use of fertilizers. However, a careful review of their published data seems to show that at least upon one end of their orchard there was some benefit from the use of potash. The land upon which this orchard was planted was chosen for its supposedly uniformity of soil, but the results published show that the available plant food content of the soil over the entire field was not constant and that apparently one end of the field was deficient in available potash. The uniformity of soil conditions for any crop cannot be determined by the external appearance of the soil nor with absolute accuracy by the behavior of other crops upon the land before the test crop was planted. Plants vary greatly in their requirements and the limiters for one crop may not be the limiters for another. The fact that a field yields a uniform number of bushels of oats per acre over its entire acreage is no sign that it will yield a uniform number of bushels of potatoes or barrels of apples per acre.

The most comprehensive set of orchard fertilizer experiments in existence are probably those inaugurated by the Pennsylvania Experiment Station in 1907. It is too soon, however, to draw any fundamental conclusions from the results so far published, although some of their results are very suggestive.

The Delaware Experiment Station has had under way a fertilizer experiment on apples covering the last six years. This is on a young orchard that just came into bearing this past season and it would be folly to attempt to draw any conclusions from the behavior of these trees. A vast difference in growth and appearance of the trees can be seen, but six years more growth may change the relative prosperity of some of these blocks. In this experiment it has been our aim to determine as far as possible the physiological office of nitrogen potash, and phosphoric acid in growing apples. So far many facts concerning the physiological function of various plant foods are surmised, but few facts are absolutely known.

Nitrogen is generally considered the element most concerned with the growth functions of a plant. It, together with phosphorus and sulphur, is concerned chiefly in the formation of protein. The general effect of heavy applications of nitrogen is to produce a heavy growth of the vegetative parts. It retards maturity of both wood and fruit in most plants. In regions subject to long, cold and severe winters, too heavy an application of nitrogen, late in the growing season, will tend to produce a soft, sappy, and perhaps immature wood that will be particularly subject to injury from cold. On the other hand, I have observed in the peach that where heavy applications of quickly available nitrogen were applied early in the spring the fruit buds were as cold resistant as any in the orchard. Properly handled, I believe that there is but little danger of winter-killing buds as the result of heavy applications of nitrogenous fertilizers. In my experience, I have found that winter-killing of fruit buds has a more direct correlation with soil moisture, air drainage, and humidity, than it has with the plant food supply. In the peach there is a decided delaying of maturity of fruit by the use of nitrogen. By the skilful handling of nitrate of soda as a fertilizer one may be able to delay the normal ripening period of this fruit from a week to ten days. Stewart had similar results with the apple. It is possible, however, that delayed maturity may be accounted for by the decrease in the amount of sunlight reaching the fruit, due to the excessive growth of foliage caused by the nitrogen in the fertilizer. One would expect that heavy applications of nitrogen would give an increased size to the fruit, but this does not appear to be so. On the contrary, we have found in peaches and Stewart has found in apples that heavy applications of mineral nitrogenous fertilizers tend to decrease the average size of the fruit. In the case of the use of barnyard manure this is not the fact; on the contrary, the size of the fruit is increased. This increase is probably due directly to the influence of the humus which barnyard manure forms in the soil, thus increasing the soil's water-holding capacity. Soil moisture probably has more to do with size of fruit than any other single factor.

Trees heavily fertilized with nitrogen, usually produce fruit that is deficient in color. The heavy growth of foliage shades the fruit to such an extent that the proper colors of the fruit fail to develop. It has been pretty conclusively proven that color is more dependent upon sunlight than upon any other factor. In fact, it may be possible that sunlight is the only factor concerned in producing color. It has also been our experience that, contrary to common belief, nitrogenous fertilizers are a great aid to a heavy set of fruit buds. In our work with peaches the trees most heavily fertilized with nitrogen have produced the greatest number of fruits, thus showing that growth and fruit production are not necessarily antagonistic functions of plants. It is probably true, however, that heavy excesses of nitrogen do seriously interfere with fruit production. The soil moisture is here again a most important factor. Decreased or delayed fruit production in orchards heavily fertilized with barnyard manure is probably due more to the addition of humus to the soil, thus increasing its water-holding capacity, than to the nitrogen in the manure.

Trees heavily fertilized with nitrogen are undoubtedly more susceptible to certain diseases than are trees not so fertilized. For instance, fire blight is known to be more virulent on trees that are growing rapidly. We have found in our work with peaches that we had more brown rot on a block of peach trees fertilized with nitrogen alone than we found with any other fertilizer treatment. (Incidentally I may remark that we picked this year an average of about eight bushels of peaches per tree from those nitrogen fed trees.) Stewart of Pennsylvania reports that nitrate-fertilized trees were more resistant to a certain leaf disease.

There has probably been more controversy over the value of potash in orchard fertilization than any other element of plant food. Potash is closely correlated with starch production in the plant, and with protein formation and accumulation. Many virtues have been ascribed to potash, such as earliness in ripening, fruit bud formation, increased color, and curative or immunizing effects upon certain diseases. In our experience with peaches, potash does not appear to hasten the maturity of the fruit to any extent and I anticipate that its effect upon apples would be entirely negligible. Fruits heavily fertilized with potash often have higher color; but this color is due not to the direct effect of the potash upon color, but to the fact that the leaf surface upon the tree may diminish and thus let in more sunlight. Potash is not a cure for disease. Heavy potash applications may cause the tree to produce a denser wood, increase the sap pressure in the cells and thus make it more difficult for certain diseases to gain a foothold in the tissues of the plant. It has been claimed that potash will tend to increase the sugar content of fruits; but this has not as yet been proven. When potash is applied to a soil that is somewhat deficient in both potash and nitrogen, its effect is to cause the foliage to assume a deeper green color. After a season or two this effect wears off. Yellowness of foliage in an orchard that is well cared for in every way and whose moisture supply is good, may be due to either lack of potash, lack of nitrogen, or both. There is a current belief that potash fertilizers add to the keeping qualities of fruit. There is some evidence to support this view, but it is not as yet conclusive. It is likely that this effect of potash would be more noticeable in peaches than in apples.

Phosphoric acid does not appear to quickly become a limiting factor in fruit production. As a usual thing most soils, except those of the Atlantic Coastal Plains and some alluvial soils of the central states, are fairly well supplied with phosphorus. Phosphorus is a necessary factor in cell division and without phosphorus no growth can take place. In peaches we find that phosphorus tends to slightly delay maturity. This is directly opposite to its effect upon most plants. In most cases the ripening process is forwarded by the use of phosphoric acid.

What the behavior of phosphorus, in this respect, is with apples, I cannot say. We have some evidence that, in peaches at least, too much phosphoric acid may seriously interfere with proper pollination of the blossoms and thus lessen the set of fruit.

Lime may be a limiting factor in apple growing, but it is my opinion that such cases are rare.

Stewart found in Pennsylvania that potash in combination with other fertilizers increased the size of fruit to some degree. His results coincide with our own experience in fertilizing peaches.

There are other elements of plant food that may be limitless in certain isolated cases. Of these, magnesia and sulphur are the most likely to be so, although recent work with vegetables and grains would indicate that some soils are deficient in sulphur. Iron is necessary to all plant growth, but practically all orchard soils are sufficiently supplied with this element. Silica, sodium and aluminum are probably present in great quantities in all soils and we need pay no attention to them.

No general fertilizer treatment can be recommended for the apple crop. The orchard in question may need it or it may not. Oftentimes it is advisable to apply readily available plant food to young trees, although the soil may be plentifully supplied. Such treatment will enable the young tree to quickly establish itself. After being once established and given an impetus for growth, it may not be necessary to add any more fertilizers.

The wise thing to do before resorting to the use of fertilizers, either commercial or barnyard manure, is to be sure that all limiting factors other than potash, phosphoric acid or nitrogen, are under control. This would mean that the moisture supply should be properly regulated either through drainage, irrigation or maintaining the humus content of the soil. I believe that failure to properly regulate the moisture content of the soil is responsible for more failures in growing apples than any other one thing. Moisture content of soils has a direct correlation with the cultural methods used in the orchard. Plant food may be present in sufficient quantities to grow an orchard profitably for a hundred or more years. Proper moisture conditions of the soil are necessary to make plant food soluble and available. Humus is an all important factor in handling orchard soils and no apple grower should neglect this point.

The disease and insect factor is also important and the apple grower should use all his resources to bring the injury from these causes down to a minimum. If an orchard has a well regulated moisture supply, if it has been properly pruned, properly sprayed and properly cultivated, and then the trees fail to do their best, then and not until then should the apple grower resort to the use of commercial fertilizers. When he does use commercial fertilizers, he should endeavor to ascertain what particular element is the one lacking.

I believe that, in many cases, what we need is not orchard fertilization but tree fertilization. There may be individual apple trees in the orchard that are not growing right or not bearing right and the grower's efforts should be directed toward these individual trees rather than to the orchard as a whole. The trouble may be in wet feet, leachy soil, disease, or insufficient plant food.

I believe that every grower of fruit should keep a record of the individual behavior of his trees. It will require only a few hours' work two or three times a year and in this way he can pick out the star boarder trees. A shovelful of nitrate of soda may change a sickly tree into a profitable one, or a few pounds of potash may change the whole bearing qualities of a tree.

I hope that I have been able to show you why I believe that those who oppose the use of commercial fertilizers and that those who advocate their use may both be right, and that they may both be wrong. It all depends upon the orchard under consideration. Because one man never needs the services of a doctor is no argument that another man does not. Apple trees are living plants and subject to the same fundamental laws of nutrition as other plants. The proper application of the facts may vary, but the fundamental fact remains a fact, nevertheless.

ANNUAL BUSINESS MEETING, THURSDAY, NOV. 19.

Meeting called to order by President Conant.

The following committee on resolutions was appointed by the president: John W. True, J. A. Roberts, Lyman K. Lee.

The secretary read a letter received from the American Pomological Society, asking that the Maine State Pomological Society elect a state vice president of the American Pomological Society. Society.

Voted, that this letter be received and that a vice president be elected.

The secretary read invitations to hold the annual meeting of 1915 in their respective cities, received from the Waterville chamber of commerce and the Portland board of trade.

It was voted that these invitations be referred to the executive committee.

All the members of the committee on storage having resigned, there was no report from that committee.

As none of the members of the committee on transportation were present, no report was received from that committee.

A. K. Gardner made the report for the committee on membership, and it was voted that this report be accepted.

A report was made by Mr. Keyser, the member of the Experiment Station Council.

The report of the committee on resolutions was presented by J. W. True, as follows, and it was voted to accept this report.

Your committee on resolutions recognize the exhibit of fruit at this annual meeting of the State Pomological Society as the largest in quantity and the best in quality in its history.

Resolved, That our thanks be extended to President Conant and the other officers of the association for their efficient management of its affairs during the year.

Resolved, That we favor the recommendation of President Conant for an experimental cold storage plant at Highmoor Farm, and his recommendation for an increased appropriation by the legislature to carry out the provisions of the Apple Grading and Packing Law; also all other recommendations made by him.

We favor and recommend a legislative committee to present these measures to the next legislature, as well as such other measures as this body or the committee may deem advisable, to promote the orchard industry of the state. The president of this association shall be chairman of the legislative committee.

We are in thorough sympathy with the extension work of the College of Agriculture under Dean Leon S. Merrill. This work is of great educational value to the people of the state who are interested in better farming. We recommend its extension into all counties and parts of the state, and that the legislature be asked to grant such appropriations as may be necessary to secure the full appropriation made by Congress.

Resolved, That this society extend its thanks to the City of Bangor and to the Bangor chamber of commerce for their invitation to hold our annual meeting in this city, and for their contributions and the contributions of the citizens of the city which have helped make the exhibition entirely successful.

We thank the railroads for favorable rates.

We thank the press for extended and favorable notices of this meeting.

We thank the College of Agriculture and the Maine Agricultural Experiment Station for their great assistance in making the exhibition successful.

JOHN W. TRUE,
J. A. ROBERTS,
L. K. LEE,
Committee on Resolutions.

On motion of Mr. Keyser, duly seconded, it was voted that a committee of two be appointed to act in connection with the president of this association as a legislative committee, and that they be instructed to carry out the recommendations of the committee on resolutions.

The following motion was made by Dr. Woods: "I move that this society use every means in its power to secure such appropriations from the state for the support of agricultural extension work in connection with the Smith-Lever Act as shall take advantage of the provisions of said act to its fullest extent."

The motion being duly seconded, it was so voted.

On motion by Mr. Keyser, duly seconded, it was voted to amend the constitution as follows: In Article II, section 1, change the clause referring to the executive committee, which now reads,—"and an executive committee, consisting of three members exclusive of the president and secretary, who shall be members ex officio," so that it shall read as follows:

"and an executive committee, consisting of three members, exclusive of the president, first vice-president, secretary and treasurer, who shall be members ex officio."

T. E. Chase presented the following report as treasurer, and it was voted that the report of the treasurer be accepted.

REPORT OF TREASURER

FOR THE YEAR 1914.

RECEIPTS.

1914.			
Jan.	20.	Interest on Bank Stock	$16 00
		Interest on Bonds	22 50
Feb.	4.	From E. L. White, balance on 1913 Advertising Acct.	59 50
April	1.	From State Stipend	84 85
	13.	From E. L. Lincoln, balance from 1913 business	252 10
June	30.	Interest on Bonds	22 50
July	7.	Interest on Bank Stock	16 00
Oct.	3.	From State Stipend	251 12
Nov.		From Advertising and Space Acct., Annual Meeting	134 00
		From Sale of Apples, Annual Meeting	35 00
		From G. R. Cooper Co. for Prizes, Annual Meeting	50 00
		From City of Bangor, for Prizes, Annual Meeting	100 00
		From Bangor Chamber of Commerce, Annual Meeting	330 00
Dec.	19.	From State Stipend	733 17
	31.	Annual Membership fees	90 00
		Life Membership fees	140 00
		Loan from Natl. Shoe & Leather Bank	300 00
		Total receipts	$2,636 74

DISBURSEMENTS.

Orders		
No. 1	Elm House, Auburn, Executive Committee Expenses	$11 50
2	E. F. Hitchings, expenses	4 98
3	J. P. Stewart, Bulletins	5 00
4	A. L. Newton, envelopes	11 16

5	W. W. Brown, postage	4	50
6	E. L. Lincoln, expenses	2	63
7	E. L. Lincoln, interest	8	34
8	Lincoln House, Field Meeting expenses	2	00
9	New Chase House, Field Meeting expenses	5	00
10	W. F. Dunham, printing	1	00
11	F. H. Morse, expenses	5	50
12	E. E. Conant, Field Meeting expenses	17	58
13	Geo. A. Yeaton, Field Meeting expenses	4	05
14	Auburn Free Press, printing	2	50
15	Forest House, Monroe, Field Meeting expenses	5	00
16	Harry W. Littlefield, Field Meeting expenses	2	15
17	Geo. A. Yeaton, Field Meeting expenses	4	13
18	E. E. Conant, Field Meeting expenses	14	21
19	W. H. Conant, Field Meeting expenses	15	27
20	F. H. Morse, Field Meeting expenses	9	25
21	Paid direct by State Treasurer from stipend	3	00
22	E. L. White, expenses	28	69
23	E. L. White, Secretary, 6 mos. salary	75	00
24	Elm House, Auburn, expenses Executive Committee	11	00
25	J. P. Hutchinson & Co., bond for Treasurer	5	00
26	Lewiston Journal Co., printing	18	27
27	Chas. E. Nash & Son, printing	5	20
28	E. F. Hitchings, expenses	6	90
29	Maine State Book Binding Co	34	45
30	W. F. Dunham, printing	5	00
31	Maine Central R. R., freight	1	62
32	Edward H. Forbush, speaker, Annual Meeting	40	30
33	Lewiston Journal Co., printing, Premium lists	37	91
34	G. B. Derby Co., trucking	2	25
35	Mrs. G. M. Seavey, on preserves		70
36	B. S. Brown, Judge, Annual Meeting	26	90
37	Mrs. J. I. Robinson, canned fruit	1	00
38	Miss E. R. Freeman, expenses	3	15
39	Banquet tickets for speakers and guests	18	00
40	H. C. Chapman Hotel Company, expenses, officers and speakers	122	25
42	Geo. A. Yeaton, Judge	28	38
43	Leland Whipple, photos	7	00
44	J. H. Putnam, speaker	35	56
46	W. Saxby Blair, speaker	60	00
47	Nellie M. Leland, Judge	4	00
48	C. A. McCue, speaker	64	16
49	O. B. Griffin, speaker	29	10
50	M. B. Chapman, Secretary's Asst. expenses	12	53
51	W. H. Conant, expenses	40	03
52	W. F. Dunham, printing	3	27
53	C. L. Gold, Judge	54	25

54	E. L. White, expenses	21 97
55	E. L. White, 6 mos. salary	75 00
56	W. W. Brown, postage	39 83
57	E. F. Hitchings, Judge	25 00
58	Mrs. E. C. Patten, damage to canned fruit	50
59	Leon S. Merrill, Federation dues	6 00
60	T. E. Chase, Treasurer, salary and expenses	37 62
61	Bangor Chamber of Commerce—tables, labor, etc., Annual Meeting	44 50
62	Premiums paid by the Society	692 50
	Special premiums	480 00
63	Mrs. W. G. Conant, Judge	2 00
64	Geo. F. Dunham, freight	2 17
65	Merrymeeting Grange, storage	1 00
66	Miss L. B. Raynes, stenographer	58 05
67	H. L. Keyser, expenses	8 25
68	F. H. Morse, expenses	11 20
69	W. H. Conant, envelopes	21 30
Nov. 20.	L. P. Patten, carpenter work	57 44
Jan. 12.	Elm House, Auburn, Executive Committee expenses	3 75
	Interest on note	3 00
Dec. 31	T. E. Chase, postage	5 00
	Lewiston Journal Co., envelopes, etc.	25 73
	Lewiston Journal Co., programs	45 00
	Total expenditures	$2,584 43
	Cash on hand	52 31
		$2,636 74

Permanent fund for the year 1913	$2,130 00	
Due for transfer to permanent fund	140 00	
Total		$2,270 00

Permanent fund invested as follows:

Four shares stock First National Bank, Farmington	$400 00
Two bonds, Stockton Springs	970 00
Deposit in Savings Bank	760 00
Due for transfer to permanent fund	140 00
Total investments	$2,270 00

Respectfully submitted,

THOMAS E. CHASE,

Treasurer.

REPORT OF SECRETARY.

During the year the executive committee has been called together three times. At the first meeting, held in Auburn, the work for the year 1913 was closed and matters in regard to the work for 1914 were taken up.

A communication from the American Pomological Society was referred to our next annual meeting.

Voted to accept the invitation from the Bangor Chamber of Commerce, provided that President Conant and Mr. Keyser could make suitable arrangements.

The secretary was instructed to purchase two hundred bulletins on Fertilization of Orchards, by Prof. J. P. Stewart, and to distribute them among the fruit growers of Maine. (Only fifty could be procured, which were mailed to a few of the fruit growers of Maine.)

The matter of field meetings was left with the president and secretary.

Voted to have the treasurer give $1,000 bond.

The second meeting of the executive committee was called to meet in Auburn, February 24. The premium list was revised and other matters in regard to our field meetings were talked over.

The first field meeting was held in the Grange hall, Cornish, April 15. The following program was carried out:

George A. Yeaton gave a talk on setting, grafting and pruning of orchards.

F. H. Morse spoke on spraying; E. E. Conant, on foreign markets, and W. H. Conant, on cultivation of orchards and co-operation.

A good many questions were asked and an enthusiastic meeting was enjoyed by the one hundred and twenty-five that were present.

A second field meeting was held in the Grange hall, Monroe, with the following speakers:

G. A. Yeaton, on pruning, grafting and the treatment of apple tree diseases; W. H. Conant, on cultivation and fertilization; A. K. Gardner, on advertising the apple; H. P. Sweetsir, on spraying; Prof. B. S. Brown, on box packing; E. E. Conant, on foreign markets.

There were seventy-five people in attendance who were interested along the lines of fruit culture and many questions were asked of the different speakers.

The third meeting of the executive committee was held in Auburn, August 13, when important matters relating to our annual meeting in Bangor were discussed and acted upon.

The membership of the society is on the increase.

It would be a great help to the work of the secretary if full post office address was given at the time of joining, and if he were notified in case of change of address.

The last meeting of the Pomological Society attracted a great deal of attention outside of the state, as requests for the proceedings were received from different parts of the United States.

With Maine's large crop of apples and the present market conditions, it is only by persistent and patient efforts on the part of the growers that they will be able to get their just returns.

Respectfully,
E. L. WHITE,
Secretary.

Voted, that the report of the secretary be accepted.

The following officers were elected for the ensuing year: President, Wilson H. Conant of Buckfield; first vice president, George A. Yeaton of Norway; second vice president, Lyman K. Lee of Foxcroft; secretary, E. L. White of Bowdoinham; treasurer, Thomas E. Chase of Buckfield; member of executive committee for three years, F. H. Morse of Waterford; member of Experiment Station Council, Howard L. Keyser of Greene; vice president or representative to the New England Fruit Show, Wilson H. Conant of Buckfield; state vice president of American Pomological Society, Howard L. Keyser of Greene.

A suggestion was made by L. K. Lee that the society offer an additional prize in connection with the Gregory contest, and on motion, duly seconded, it was voted to leave this matter in the hands of the executive committee.

On motion, duly seconded, it was voted that the member of the Experiment Station Council serve as a visitor to the College of Agriculture.

EXPERIMENTAL WORK IN NOVA SCOTIA, RELATING TO APPLE SCAB CONTROL.

Prof. W. Saxby Blair, Kentville, N. S.

Mr. Chairman, Ladies and Gentlemen:

It gives me great pleasure to have this opportunity of meeting with the Maine fruit growers. I have heard about the progress that is being made in Maine in the development of the fruit industry, and certainly it is a pleasure to come here and see the excellent fruit you are putting up. We in Nova Scotia feel that you have a good fruit country, for we come in competition with your fruit in our exports to the old country, and we know right well that you know how to put up a good class of product. Like ourselves, you are pushing ahead and trying to develop the very best quality of fruit that you possibly can, and no doubt you feel that you cannot get too much help from outside sections in order that you may make a still greater success of the fruit business.

In connection with our experimental work in Nova Scotia, the Dominion Government a few years ago decided that a fruit station in the Annapolis Valley would be a good thing for the fruit growers. The fruit area of Nova Scotia, as many of you know, is confined to the three counties which are located between the North and the South mountains. These mountains give a certain protection to the valley between, and in this region the bulk of the fruit is grown. Large orchards have been planted and the orchard area extended until at the present time we export annually about a million barrels of apples. These apples we think are of exceptionally good quality. In connection, then, with the development of this industry, this fruit station was established at Kentville, N. S., as part of the Dominion experimental farm's line of experiment stations, and I am in control of the work there. As this is a new station and no mature orchards are available on it for experimental work, authority was given that we should carry on a certain number of experiments in a section of each of the counties, Kings, Hants and Annapolis. We have, therefore, for two years, been experimenting to determine if possible what are the best sprays for the control of apple scab, what time the sprays should be put on in order to get the best results, and what combination of sprays will give us the best fruit.

To begin with, we found that a number of fruit growers are not getting profitable results in connection with their spraying operations. They were spraying thoroughly, apparently, and yet their fruit was not of the quality that we would like. A great number of growers said that we could not possibly expect to get clean fruit with the use of lime-sulphur. They had been able to get clean fruit with the use of Bordeaux, but they had burning of foliage and rusting of the fruit so that they were not satisfied with the use of Bordeaux for the control of scab. And yet, when they used lime-sulphur they did not get the results they anticipated.

Our first experimental work then consisted in determining whether lime-sulphur would control scab equally as well as Bordeaux. And we have found from our experiments carried over two years, at least, that these two materials have equal value as fungicides. As a summary of our experiments, we find the following:

For 1913	% Scab.
Bordeaux	7.2
Lime-sulphur	5.37
No spray	59.6

For 1914.	Gravenstein % Scab.	Spy % Scab.	G. Russet % Scab.
Bordeaux 3-3-40	0.09	1.34	.16
Bordeaux 4-4-40	0	.32	0
Lime-sulphur 1.008	.63	0	.5
No Spray	18.47	30.77	5.28

Bordeaux made up of 3 lbs. lime, 3 lbs. copper sulphate, with water to make 40 gallons of mixture; also 4 lbs. lime, 4 lbs. copper sulphate with water to make 40 gallons of mixture, were compared with the usual strength of lime-sulphur, 1.008. specific gravity, or 1 gallon commercial concentrate to 34 gallons of water. Two pounds arsenate of lead to 40 gallons was added to each of the above mixtures. The application was made on all the plots on the same date. Two applications were made before the blossoms opened and two after. Gravenstein, King, Ribston and Ben Davis were included in the 1913 test.

RUSSETING OF FRUIT CAUSED BY BORDEAUX ARSENATE AS COMPARED WITH LIME-SULPHUR ARSENATE.

In order to determine the amount of russeting caused by the use of Bordeaux arsenate as compared with lime-sulphur arsenate, plots were sprayed on the same date and records obtained with the following results:

1913	% Russet.
Bordeaux	71.47
Lime-sulphur	2.5

The above is the average of various experiments, including the Ribston, Ben Davis, King, Spy and Gravenstein. Our results for 1914 are very similar and indicate that russeting from Bordeaux may cause considerable loss if a high class product is to be obtained.

1914	% Russet. Gravenstein	% Russet. Spy
Bordeaux, 3-3-40	84.35	1.15
Bordeaux, 4-4-40	81.08	1.9
Lime-sulphur 1.008	3.03	.23

Comparing the Bordeaux with lime-sulphur fruit in the packed out results we find a decided loss from the russet caused from Bordeaux, which was as follows:

Loss in Gravensteins per 100 bbls	$33.01
Loss in Ben Davis per 100 bbls	31.29
Loss in Ribston per 100 bbls	39.41

That is, the fruit may have been as large, the fruit was as clean, but the loss resulted from the fact that we had a certain number of apples russeted, and those badly russeted could not be put into the No. 1 class and had to go as No. 2 or 3, and consequently brought a lower price. I am just bringing this to your attention for this reason, that it is not so much a question for us as to whether the one is better fungicide than the other, but it is a question whether we can get more dollars out of our fruit by using one material rather than the other. And from the experiments we have carried on so far we find that if we wish to get the greatest number of dollars possible out of our fruit it is much better to use the lime-sulphur than the Bordeaux.

Question: How did Bordeaux affect the foliage?

PROF. BLAIR: In the case of the King apples we had very severe injury to the foliage in one of our orchards in 1913, which was noticeable throughout the whole season. In another orchard at Bridgetown the injury was not nearly so apparent; in fact, the foliage during the first part of the season on the trees that were sprayed with Bordeaux was much healthier looking than that on the trees sprayed with lime-sulphur, but this condition reversed before the end of the season, and the lime-sulphur foliage was better on the trees than where Bordeaux had been used. This year we took particular notes as to the foliage conditions and we could not notice any particular difference between the lime-sulphur and the Bordeaux foliage. Consequently we concluded that the climatic conditions that followed the application of Bordeaux, and the condition of the tree and the health of the tree, are all factors as to the amount of injury that may result from the use of Bordeaux.

BORDEAUX BEFORE BLOSSOMS OPEN VS. LIME-SULPHUR.

These tests were conducted on a block of Gravensteins at Berwick and were for the purpose of finding out whether Bordeaux applications before the blossoms opened would control scab equally as well as lime-sulphur. All the applications after the petals fell were lime-sulphur 1.008 and applied at the same date. The sprays before the blossoms opened were on the same date.

Sprays before blossoms opened.	April 25 Dormant.	May 18	May 28	% Scab.
Lime sulphur..	1.014	1.008	1.008	4.3
No Dormant...		1.008	1.008	5.52
Bluestone	1 to 15	4-4-40	4-4-40	5.64
No dormant...		4-4-40	4-4-40	1.8
Bordeaux	4-4-40	4-4-40	4-4-40	.63
Bordeaux	3-3-30	3-3-40	3-3-40	5.51
Bordeaux		3-3-40	3-3-40	No Fruit
No Spray.....				68.21

THE VALUE OF THE DORMANT SPRAY FOR CONTROL OF APPLE SCAB.

Experiments were carried out in each of the experimental orchards to determine the value of the dormant spray, in addition to the usual sprays for the control of scab. The only difference in application in these plots is that in Berwick a spray of 1.014 specific gravity, or 1 to 20 (1 gallon Commercial concentrate to 19 of water), and in the other orchards a spray of 1.028 or 1 to 10 (1 gallon of commercial concentrate to 9 of water) were applied when the trees were dormant the latter part of April. After the dormant spray was applied all plots were sprayed alike and on the same date with the usual lime-sulphur arsenate spray, two applications before blossoms open and two after. It will be seen that in this test the dormant spray was of little value for the control of scab.

Gravensteins at Berwick.	% Scab.
Dormant and regular sprays	4.3
No dormant, regular sprays only	5.52
No spray	75.44
Kings at Berwick.	
Dormant and regular sprays	1.06
No dormant, regular sprays only	0.00
No spray	34.91
Russets at Falmouth.	
Dormant and regular sprays	2.67
No dormant, regular sprays only	4.71
No spray	37.74
Ben Davis at Falmouth.	
Dormant and regular sprays	.61
No dormant, regular sprays only	1.2
No spray	30.35
Gravensteins at Falmouth.	
Dormant and regular sprays	.4
No dormant, regular sprays only	1.35
No spray	52.22
Kings at Falmouth.	
Dormant and regular sprays	.96
No dormant, regular sprays only	1.63
No spray	38.37
Gravensteins at Bridgetown.	
Dormant and regular sprays	.45
No dormant, regular sprays only	1.70
No spray	54
Average.	
Dormant and the regular sprays	1.49
No dormant, regular sprays only	2.30
No spray	46.14

A COMPARISON OF LIME-SULPHUR SPRAYS OF DIFFERENT STRENGTH.

In order to determine whether a lime-sulphur spray stronger than that usually advised is necessary, a series of tests were conducted on a Spy block in Berwick, using 1 to 30, 1 to 35, and 1 to 40 strength throughout the season. Arsenate of lead, 2 lbs. to 40 gallons, was used in each case. It would appear that the 1 to 40, or the one having a specific gravity test of 1.007, is practically as effective as the stronger lime-sulphur. Three applications were made, one just before the blossoms opened, June 2, and two after, June 23 and July 10.

	% Scab.
1.009 specific gravity test, or approximately 1 to 31...	0.18
1.008 specific gravity test, or approximately 1 to 35...	0.15
1.007 specific gravity test, or approximately 1 to 40...	0.49
No spray	73.27

A COMPARISON OF LIME-SULPHUR ARSENATE OF DIFFERENT STRENGTHS FOR THE FIRST SPRAY.

To find out whether a strong lime-sulphur spray for the first application will control scab better than a weak one a series of tests were made on Kings and Gravensteins at Berwick, and on Baldwins at Bridgetown. The trees were sprayed three times and the difference in strength of mixture was confined to the first spray before the blossoms opened, May 28. The applications following this were alike. The results obtained were as follows:

Kings.	% Scab.
1.014 Specific gravity, or 1 to 20........	.77
1.009 Specific gravity, or 1 to 31........	1.92
1.008 Specific gravity, or 1 to 35........	1.07
No spray	34.91
Gravensteins.	% Scab.
1.014 Specific gravity, or 1 to 20........	0.61
1.008 Specific gravity, or 1 to 35........	5.52
No spray	60.98
Baldwin.	
1.014 Specific gravity, or 1 to 20........	0.56
1.008 Specific gravity, or 1 to 35........	1.32
No spray	22.5

VALUE OF ARSENATE OF LEAD IN LIME-SULPHUR FOR CONTROL OF SCAB.

Arsenate of lead added to the lime-sulphur spray is considered to greatly increase its fungicidal value. A series of tests to get additional information as to the actual gain from its use for the control of scab was undertaken. Arsenate of lead is necessary for the control of insects and for this reason cannot be left out of our sprays. Its value as a fungicide has not, however, shown up very great in these experiments.

All plots were sprayed at the same time, May 25, June 20 and July 6, with the same strength lime-sulphur, 1.009 specific gravity, for the first spray and 1.008 for the next two applications. This test was conducted at Falmouth.

Arsenate of Lead to 100 Gallons of Lime-Sulphur.	Golden Russet. % of scab.	Ben Davis. % of scab.	Gravenstein. % of scab.	Ribston. % of scab.	King. % of scab.
7½ lbs. neutral lead	4.33	1.31	.06	1.19	no fruit.
5 " " "	2.55	.47	2.02	.94	" "
5 " acid lead	4.71	1.2	1.35	no fruit.	1.63
2½ " neutral lead	1.9	.16	2.12	" "	no fruit.
2 " dry lead	3.42	.00	.58	.51	.67
Lime-sulphur only	3.54	1.17	6.12	1.09	1.37
No spray	no fruit.	23.72	52.33	no fruit.	34.56

COMMERCIAL CONCENTRATE VERSUS HOME BOILED CONCENTRATE LIME-SULPHUR.

Eight different experiments were conducted with home boiled concentrate and commercial concentrate lime-sulphur applied at the same strength, 1.008, with arsenate of lead added. One application was made before the blossoms opened and two after. The following is a summary of the results.

	% Scab.
Commercial concentrate	1.38
Home boiled concentrate	.94
No spray	50.8

WHICH SPRAY IS THE MOST IMPORTANT.

In order to determine if possible the relative importance for scab control, of the different sprays, a series of tests were made at Berwick. Lime-sulphur arsenate of the same strength was used throughout. It would appear that the most important spray this season was that just before the blossoms opened, and the second of importance just after the petals fell. Last season it was the one just after the leaf buds opened which gave the best results and the one just before the blossoms opened was of second value. The results obtained are as follows:

King Trees at Berwick.

Application.	% Scab.
Two before, and two after blossoming	0.00
Two before, and one just after blossoming	1.51
Two before blossoming	2.98
One just after leaves expanded, May 18	20.66
No spray	34.91

Gravenstein Trees at Berwick.

Application.	
Two before, and one just after blossoming	1.12
Two before blossoming	8.50
One before blossoming, just after leaf buds expanded, May 18	51.79
One just before blossoms opened, May 28	9.51
One just before blossoms opened, and two after	2.28
One of Bordeaux 4-4-40, just before blossoms opened, and two after	1.21
No spray	62.22

In 1913, experiments at our Falmouth orchards resulted as follows:

Date of spraying.	
May 9, May 20, June 11, June 23, July 14	3.52
May 20, June 11, June 23	20.54
June 11, June 23, July 14	83.63
No spray	87.35

Question: How did the weather conditions compare?

PROF. BLAIR: This year we had cool weather conditions during the early part of the season, later warm and the trees came into blossom much more rapidly than the previous year. I should judge the weather conditions were more normal than last year.

Question: Do you use soluble sulphur?

PROF. BLAIR: Yes, we used soluble sulphur this year in some of our experimental plots. We had a considerable burning on some of the plots. We used it just a little stronger than it is recommended, to find out just the effect on the foliage if farmers should use a little too much, and we had a little burning. We did that for the purpose of pointing out the desirability of using every care in the handling of this material. You can however, use Barium Chloride which, if mixed with the soluble sulphur spray, will to a very large extent do away with this possible injury. We did not get as good control of scab, but that might have been due to the fact that our tests were not complete enough.

Question: How much do you put on?

PROF. BLAIR: We try to get the foliage covered. If you are using a pump with considerable force such as the Bean pump, you are bound to get considerable drip; with the Air-tight or Pittsburg you can give your trees a nice coating without much drip.

Question: What are your results, whether the trees drip or not?

PROF. BLAIR: I am sorry to say that we have no data on that. A lot of our fruit growers think that unless they get the trees to drip they do not get an even application. I don't see how it is possible to spray a tree with the average spray pump without getting a very heavy dripping.

Question: Doesn't it run to the point of the leaves where it drips?

PROF. BLAIR: It is bound to. You cannot avoid that; I do not know of any way to avoid it, except with your mist spray.

Question: How heavy pressure do you use?

PROF. BLAIR: Two hundred to two hundred and twenty-five. With the Bean pump, 225 lbs. or, with the air-tight steel tank Pittsburg pump, we run about 85 lbs. We have been using the Pittsburg pump in some of our experimental work this last year.

Question: In this control of scab, do you take into consideration a rain storm? Would you spray just before a storm if you knew it was coming on?

PROF. BLAIR: Spray just after a rain. If it rains and washes the spray off we do it again. It is hardly safe to run your chance in such a case. We like to be sure, even if we have to do it a second time.

Question: I would like to ask if you would not get about the same results in spraying with a low pressure pump, that is, 80 lbs., if you had a fine disc, forcing the spray through it, as you would with a 200 lb. pressure with a larger disc.

Prof. Blair: What we figure on is the amount of surface that we can cover in a given time. We cannot afford to spend that much time. When you have a small disc you will only get so many gallons with the 80 lbs. pressure, in a certain time. We are not satisfied, and want larger discs and more pressure.

Question: You cut down your capacity?

Prof. Blair: Yes, the whole idea of the bigger outlet and the power is to put on instead of 500 gallons in a day, 1200 gallons in a day or more and get the work done. Where we have our large orchards we have to figure on that very closely.

Question: Doesn't it run off the upper part of the leaf, leaving it on the tip entirely?

Prof. Blair: You will have a heavier coating on the tip, but still you have a coating above, just the same.

Question: Enough so it shows very plain?

Prof. Blair: Well, it will show. It will not show very plain, but so that you can notice a coating there. I do not see that it is necessary that there should be a very thick coating, except that if you have a heavy coating when the leaf is quite young it will be reasonable to suppose that it would give you longer protection, because, as the leaf expands the coating must gradually get thinner, hence the importance, or what we thought was the importance, of using a greater strength for the first sprays in order to give us the necessary protection over a longer period.

Question: Your figures on the arsenate of lead, were they on the dry or wet arsenate?

Prof. Blair: The figures that I have given you were for the most part paste arsenate.

Question: Did you use dry and wet, pound for pound?

Prof. Blair: No, no, 5 lbs. paste to 100 gallons, 2 lbs. dry to 100 gallons.

Question: That is what I was getting at. I would like to ask how this pump is made that gives you the same result at 80 lbs., as the old pump at 200. That is a new thing to me.

Prof Blair: If you write to the Air Tight Steel Tank Co., Pittsburg, Penn., they will send you a catalogue. The whole thing is simply this, the liquid is forced out under a certain air pressure and then there is another lead of hose to carry the air up to the nozzle, and as the liquid emerges through the nozzle at, say, 80 lbs. pressure, this air jet at 80 lbs. pressure strikes the liquid and assists in making it into a mist. We think a whole lot of the pump but it may not be better than some of the others.

SMALL FRUIT CULTURE.

By J. H. Putnam, Litchfield, Conn.

I am glad to come up here today and to bring to you the greetings of the Connecticut Pomological Society.

I have been asked to speak on the subject of small fruits. The interest in fruit growing has increased at a tremendous rate in the last few years. Especially in apples and large fruits has this been so. But this means also an increase in interest in the small fruits, because lots of these large fruits don't pay at first. While the orchardists are waiting for the large fruits to come into bearing they want to produce something that will give them quick returns, and they become interested in small fruit growing. I think we need not be afraid of this. While this year there may seem to be a little over-production, we need not be afraid of this sweeping enthusiasm in fruit growing which is going on all over the country.

Bacon wrote, "When ages grow to civility and elegance, men come to build stately sooner than to garden finely, as though gardening were the greater excellence." History has proved this to be true. It is only when the development of the sciences gives us the keys to nature's secrets, when the study of the fine arts has created a refined taste, and when the development of manufactories and the extension of commerce have created the wealth to purchase, that the united application of art, science and distribution to agriculture gives us the finished product of the modern skilled fruit grower.

In the growing of fruit the first thing to be considered, as in any other business, is the man, the individual. Some people think it requires a knack. Now, it does not, but it requires care. You can all remember some old farm house where there seem to be no conditions favorable for the growth of plants, but the little old lady who lives there—or it may be a young lady, or even a little child—has them in her window, waters them carefully, and puts papers around them to protect them when the mercury goes down. You would say, "Why, she can never make plants grow there," but some day the last of winter you drive by and her windows are filled with blooms, many more than you will see in fine, warm, steam-heated houses where conditions are better, and you say, "Why is it?" I can tell you. It is because this old lady loves her plants. She knows what they want and she does the best she can to supply their needs. It is the sentimental fruit grower that is going to be successful. The fruit grower must get into communion with his plants Not every man is such a man, but every man who is willing to give attention to details, and is willing to work hard, and is willing to smile when he finds that the weather has practically spoiled his products,—such a man is going to make a success of fruit growing.

Now I haven't anything new to tell you about growing small fruits. A good many of you here probably know more than I know, after having had speakers come before you for twenty years and tell you all there is to tell about growing small fruits I am a great deal like the frog who found himself in a can of milk that a farmer shipped to market. Now this frog was very much afraid that he would be drowned, but determined to do all in his power to prevent such a disaster. He found it pretty hard work to keep afloat, but he kept paddling, paddling, and by and by he churned the milk into butter, and he floated into Boston on a good big lump of butter, placid and content. Perhaps if we keep agitating a little, we can get something out of this after all.

The first fruit which comes on and the one which is the most enjoyable, coming with a freshness which the apple has ceased to have, is the strawberry, one of the most valuable of all the small fruits. Nothing can beat the strawberry in its season. This fruit very fortunately lends itself to a variety of soils. Different varieties require different soils and if you will only get the right kind of variety, you can hope to grow the strawberry fairly well in any reasonably cultivable soil. A very heavy soil, standing in water, or a very light soil which will persist in drying up as the berry comes on, of course will not grow good strawberries, but in between is a large variety of soils which can be used with good results. As a rule, the early varieties do better on a light soil, and the late varieties do better on the heavy soils.

The preparation of the soil is the first and most important subject, and while we are on that, we might as well say what will cover all small fruits and all large fruits, and all crops as well,—the soil should be thoroughly prepared. I don't believe any of you here ever prepared a plot for any crop so well that when you had finished it you could not have done it better. You cannot prepare a plot too well for strawberries. Never use an old sod if it can be avoided. It is better to cultivate some other crop the first year. A field that has been cultivated the year before with potatoes and then given rye, turned in in the spring, or even left without it, makes a good soil for strawberries. It should be thoroughly prepared and just as early in the spring as you can possibly do it and do it right. But you do not want to plow before your soil is ready. If you do, you pack your soil and you never can break up the lumps. You must not plow too early, but just as early as your soil will work properly.

I am taking for granted that you will set strawberries in the spring. There is no other time to set strawberries for commercial purposes.

The soil should be thoroughly fertilized. Give it a good coat of barnyard manure, and if you haven't enough of that, give it a commercial fertilizer, analyzing about 3-8-10; this will depend on the requirements of your soil. Just before fruiting some use a little nitrate of soda, but be careful or you will get too much foliage growth and a soft berry, more likely to be cut down by blight or rust. If it doesn't start off real well, a little nitrate of soda put on when it is dry so it will not burn the foliage may be beneficial to the crop. But remember the nitrate of soda is likely to give you a larger, softer berry and without the quality you get with more potash and less nitrogen.

Now as to the plants you are going to set. I want good strong plants taken from a new bed. I have little faith in pedigree plants. I think that the selection of strong, mature individuals will accomplish all that the pedigree will. You should get your strawberry plants from a good, healthy bed, and good, vigorous plants. We are likely to dig a few of the late set runners, that are not good for anything else, for plants. They are not worth much for plants. You should get strong, thrifty ones to start with. Dig up some of your best ones to set.

As to the variety, it depends on the soil requirements and also on your market. For home use you can grow some of the varieties too tender to stand shipping. For market, you have to find a berry that will stand up. For myself, I grow the Marshall for our own use, and for the market, the Brandywine is our standard berry. I was up in Vermont a couple of years ago, speaking about some apples, and I wasn't very well acquainted with conditions there any more than I am here in small fruit culture, so I said, "I don't know what to say about varieties in this particular spot, but it is a pretty sure thing when you are in doubt to plant Baldwins." Whereupon a man in the audience arose and said, "I will have you understand that no Baldwin apple tree ever grew to bearing age in this 'ere country." He was right, and I was recommending the Baldwin apple tree where they would not live to bearing age. So I don't attempt to recommend any particular variety for any particular locality. Plant a few different kinds and find what will grow on your soil and under your conditions.

I like to set the strawberry plants in rows three feet apart, two feet apart in the row, and keep them in a narrow mat. You always get your best strawberries on the outside of the row. Experiments have shown that six inches apart in the row will give the largest yield and best berries. You can plant a wide matted row four feet apart and the rows two feet apart and thin out your runners and get those conditions. It is expensive. You can set them out that distance apart, but it is too expensive—you can't afford to do it. But by setting fairly close and keeping the rows narrow, and in the fall keeping the runners cut out, you can get those conditions, and get good fruit and get it cheaper. We need not only to get good fruit, but at an expense low enough so that we can make a profit on it when we come to sell it. I like the narrow matted row system the best of any. Remember, a strawberry plant is just as much a weed in a strawberry bed as any other weed after you have a certain number of plants set in the bed.

Question: Regarding varieties, what is your opinion of the fall bearers,—what are termed perpetual bearers?

Mr. Putnam: Let them alone commercially. If you want to play with them a little bit by yourself, all right. There are a few of those that do fairly well but it costs. You must have the blossoms all off the first crop if you want to get a second crop. As a rule, people will not pay the price for out-of-season produce that it costs to raise it. If you take pains with them, keep them heavily cultivated, and cut off the blossoms early in the season. You will get a few good berries, but as a commercial proposition, I do not believe they will be a success. The same thing applies to the fall bearing raspberry.

Question: How much does it cost?

Mr. Putnam: You can raise them for twenty-five to thirty cents a basket, I guess, all right, and if you do it after you get through working, at night, you never will miss the cost.

The first year you should keep your strawberries thoroughly cultivated, free from weeds. In the fall, when you can drive on without cutting through the ground you should mulch them. I like strawy horse manure for a mulch. Be careful not to put on too much so as to smother the plants. Cover them over and keep them frozen; keep them from thawing. The mulch holds the snow on and keeps them from freezing and thawing alternately,—protects them in that way.

Question. Has the time passed yet to mulch?

Mr. Putnam: No; up here is a good time now to do it. If I have straw or hay mulch it is pretty likely to blow off, but when the first good snow squall comes on the straw, that snow will hold the straw down well. It will freeze to the ground, and then it will stay all winter. The horse manure may be put on any time when the ground is frozen enough so as to drive over the rows without cutting the strawberry plants.

Now as to picking and marketing. I sort my berries for a special market. All my berries are sorted except the last picking. I can't get pickers that I can trust. They all come to the table and are sorted very rapidly. If your berries are running good you will get almost as many baskets as you had to start with and your baskets of seconds extra which will bring about as much as the mixed berries. The little ones only fill in between the big ones. This is especially true of the Brandywine. It has a large hull. Sorting is a commercial proposition. It is just the same as with your apples. You know they will bring a great deal more than the apples off the same tree if they were all mixed together.

Question: What is the cost of picking and grading?

Mr. Putnam: Well, it depends altogether on who does it. I couldn't say just how quickly I can grade strawberries—it depends on how they are running—but I can run over a crate of berries in ten minutes and grade them.

Question: You don't face them up?

Mr. Putnam: All faced as they go; but we don't handle the berry. We have a packing table which stands about the height of our elbows. The berries are brought in on trays, carrying eight boxes. The tray is a little board with a leg in each corner, slats nailed around the edges and a half of a barrel stave for a handle. They are set on the table as they bring them in. Take one of those boxes, with an empty box in front of you, and pour them out into the other box, and pick out the poor ones as you run them over. If you could have pickers that you could trust, you could have them sort. Now remember, this is wholly for my market. I have a near-by market. Those berries are all delivered within two hours from the time they are picked from the vines, and that is a different proposition from a shipment to Boston or Portland or somewhere else. Of course, then, by handling it may hurt the berries about standing up. If you can trust your pickers to grade them as they pick them, so much the better.

Question: What does this facing consist of? Is it anything more than leveling off?

Mr. Putnam: No, sir. Our berries have sold in the same market for sixteen years. A man offered me last year sixteen cents a quart for all my berries straight, first and second. And those people know my berries. If I had faced them in the first place they wouldn't be offering me sixteen cents a box for everything.

Some years ago I planted two plots of strawberries and kept exact account of the cost of each from the time of planting until cultivation ceased. This did not take into account the cost of mulching, the cost of fitting the land, or the manure and fertilizers. One plot was composed of nine beds of four rows each, rows one foot apart, plants one foot apart in the rows and beds two feet apart. This system is commonly known as the Kivet system. This made 4500 feet of land and took 3600 plants. The cost of planting, cultivating and keeping all runners cut off was $25.10 or at the rate of $243 per acre for labor of planting and growing. I charged nothing for the plants, simply the cost of digging, trimming and planting, which I found was about 15 cents per hundred. If I had purchased the plants at $3 per thousand it would have cost $105 per acre, as it takes 35,000 to plant an acre this way.

The other plot consisted of 1300 plants placed in rows three feet apart and two feet in the row, thus making a little less than one-fifth of an acre, or about twice the amount in the other plot. On one-half of this bed were matted rows and on the other half I placed the runners, letting five set to each old plant and cutting off the rest. The cost of this bed was $22.10 or $125 per acre, just about one-half of the other. Of course the cost of growing the matted row half was less than the set runners, but I did not keep separate accounts.

As to the yields, the yield was nearly the same in proportion on the two plots, that is, about 500 quarts on the Kivet bed and 1000 quarts on the other bed of twice the size. The matted rows gave me the most berries and the set runners gave me a little the best berries. This trial was not quite fair as I ran out of plants for the Kivet bed of the varieties I planted in the other and had to use some varieties that I do not consider as good for that method of growing, but after two years' trial I gave up the close planting as not profitable for me. I now practice the narrow matted row for the field and the placed runners for the garden.

For planting, I prefer a good strong mason's trowel to any other implement I have tried. When you dig your plants, pick off all the leaves except one or two. As you pick over your plants and take them up in your hands, twenty-five to the bunch —dip the tops into a pail of Bordeaux mixture and place them in a basket with some moss on straw, for the roots.

Question: Do you cut off the ends of those bunches?

Mr. Putnam: I do usually, about one-quarter to one-third of the roots; they will throw off fine fibres better.

Question: Do you object to setting with a spade?

Mr. Putnam: I prefer a trowel to anything I have ever used. A spade is all right.

Question: You work just one man?

Mr. Putnam: Yes, one man drops the plants ahead for two or three to set. One man, if he is smart, drops plants for three to set. The mason's trowel gives you about the same hole you could get with the spade, and I like to get down on my knees. I like to get my knuckles upon a plant when I set it.

Question: You would rather do that than put your heel on?

Mr. Putnam: Yes, sir.

Question: Do they set with the spade much in your section?

Mr. Putnam: Not so very much. They do some. If your ground is perfectly fitted you can set with your hand and set them good, too. You don't need much of anything to dig the hole with if your ground is nice and mellow and right. You want to have the roots thoroughly spread out. Don't set them in a bunch. And they should be set so that every leaf may be pulled off without starting the strawberry plant.

The raspberry comes next in value, I think, as a commercial plant. It will not take quite as heavy or quite as light a soil as the strawberry. It prefers a good corn soil. It will stand wet feet quite as much as some strawberries, and it ripens in the dry time of the year, from July up to the first of August, at a time when you are likely to have a drought, and if you have it on a very light soil your berries are likely to dry up. Your soil should be well fertilized and properly prepared and you should have healthy plants from a healthy field—put that down and stick to it. The first year I like to plough furrows three feet apart right across the field and then plant in every other furrow about two or three feet apart, planting a row of potatoes between, and cultivating as you would for potatoes the first of it, and you get a good crop of potatoes. I don't summer prune my plants. I have been in the habit of laying them down, and if you get a stocky plant you cannot lay it down; you want a long shoot. I have never pinched them back in the summer. The last two years I have not laid them down and have had good success without protection. Remember this point: Cut out your raspberry canes just as soon as they are through fruiting. I never did in my life, but I ought to do it. Business is rushing so just then that we usually wait and do it in the fall, and in the spring go through and thin down to what we want, cutting back what is winter-killed. This is one way to control raspberry diseases satisfactorily: Keep your bed clean and if you see a cane which shows the least sign of disease, cut it out and burn it.

Question: There is one advantage in our section, with our climate, in leaving the old canes to support the new canes, to prevent their breaking down.

MR. PUTNAM: Let me tell you my method. It may help you. I plant in rows six feet apart with plants four feet and let them make solid rows. I set posts about 25 feet apart and two and a half feet high, and drive a nail in the top. I then stretch a No. 13 wire rather loosely on each side and hook it over the nails. I can easily throw this wire down for pruning and hang it up to keep the plants in for cultivating. You can get second hand telephone wire which will cost almost nothing.

The raspberry has to be marketed very quickly. You people everywhere in New England have a home market more than you think you have if you would spend time in developing it. I have shipped my raspberries away when I could have sold them near home if I had taken the trouble. With the raspberries you sometimes get three days' rain in the middle of your best crop. This ruins them for market, but if you can evaporate them, you can use a big paddle for picking and you can perhaps save your profit on your crop. The small fruit grower has his troubles as have the growers of large fruit. There will be years just as you are getting this year with the apples, when things don't look so hopeful, but on the whole they are a pretty profitable proposition.

The black raspberry is propagated from the tips, otherwise it is handled in much the same way. I think it best to pinch it back. Another thing, in regard to red raspberries,—I never cultivate them after I pick them. I am up 1200 feet, in an entirely different climate from New Haven, and I have to look out for the winter-killing, as you do here. You want to ripen your cane early and get it mature. We are about ten days later than they are at New Haven with their crop. Consequently if, after we finished picking our crop, we cultivated our raspberries and started fresh growth, the canes would not ripen sufficiently. I get my strawberries as late as I can. I am behind the main market of my vicinity, consequently if I tried to get my crop in market early I would get my earliest berries in with their main crop and I would be left no profit. Consequently I keep my berries as late as I can, keeping my mulch on as late in the spring as I can, but not too late or they will burn and heat. You should watch them. I keep them back as long as I can and then I get my main crop in as the other people get the last of theirs in, and the market is mine.

I stop cultivating my raspberries as soon as they begin to ripen, and let the weeds grow, and then I turn a furrow against those raspberries. Perhaps that is wrong theoretically but it has been very successful with me. I do the same with my currants. I turn a furrow from each side right in upon my raspberries and currants. It mounds them and lets the water drain off between them and covers the roots in the winter. Of course it exposes them between. It turns under the weeds pretty well and when you hoe in the spring it leaves your raspberry row pretty clean and easy to handle.

Question: Do you put any fertilizer in that row?

Mr. Putnam: We spread stable manure through the winter upon this raspberry patch as we can get in there. I was down to Mr. Margeson's in Westwood, Mass., who has ten acres from which he took $5000 worth of fruit. You can't get in there with a horse and wagon. There are apple trees, plums, cherries, and in between them currants, and every bit of fertilizer comes in on a wheelbarrow. That is intensive small fruit growing. We get the fertilizer, horse manure, on through the winter. In the spring, cultivate and hoe this in between the rows. It works out pretty well for us.

You have to select hardy varieties in the blackberry and raspberry. I use the Herbert and Cuthbert in the raspberry. I am much pleased with the Herbert and confine myself to it almost wholly. The Snyder is the hardiest of the varieties of the blackberry, about the only one I would try to grow commercially. Blackberries should not be nearer than eight feet apart. They should be trellised in the same way as the raspberries, but the posts should be higher. The cultivation of the raspberry will pretty nearly cover that for the blackberry. It probably pays to spray these cane fruits and your strawberries, too.

Question: How about the Agawam?

MR. PUTNAM: It is a good berry; it is not so hardy as the Snyder.

The currant is one of the most profitable small fruits. It makes a splendid filler for an orchard. It needs a rather heavy soil. It will not do well on a gravelly soil. It needs to be cultivated. The old-fashioned way of letting the currants grow under the garden wall and expecting to get good fruit is just as ridiculous as to grow apples in the pasture. It requires heavy manuring, likewise a little lime in the soil—rather heavy soil. I would set two year old plants. I prefer to set them not nearer than 5 x 5, although I have some set 4 x 4. Prune them the first year or two, cutting back about one-third growth to keep them down, and then cut off some of the old wood each year that has been bearing for two or three years, so you will have some new wood coming along all the time, and you will keep your bushes in pretty good condition. You should spray your currants for the currant worm and of course if you have San Jose scale in your vicinity you should spray them for that. Spray them just the time when the currants are setting—when the petals are falling. That is the time that I find the first worm. You should take him within fifteen minutes or he will get ahead of you. Then I give them a spray of a Bordeaux mixture or 1-50 lime sulphur and 3 lbs. arsenate of lead. If you let them get very big you will spot your currants and they will show it because the arsenate of lead sticks. There is a market for black currants if you make it.

You ought to grow plenty of grapes for the family if you don't care to for market. It is one of the best fruits and we don't appreciate the fact that we can keep grapes for the family for quite a while. You can keep grapes very well if you will take a little pains, in the cellar on slatted frames, and you can grow them well here. If I had time I would like to take up the grape question a little. I don't believe you are growing all the grapes you can in Maine. You cannot grow them on heavy soil. If you have a steep side hill, rocky, with a south slope which isn't worth much of anything else, you can raise good grapes. You should plant the hardy and early maturing varieties.

I want to say, as I have said once before today, that I think we look too far away for our markets. In his famous lecture, "Acres of Diamonds," Russell H. Conwell tells the story of the man who, after a struggle with a refractory collar button, invented the lever button and made a large fortune from the royalties. He had been going around all his life with his fortune under his chin and couldn't see it. We farmers in New England are something like that. We have the good markets here, and they have the money to pay for quality. Let our watchword be "Quality," so when any one buys a New England grown article he will know that it will be fresh and good. And don't put all your eggs in one basket. Grow small fruits along with apples, so if your apples are a glut you will have something else to fall back upon. If we will put the best that is in us into this thing to produce the best quality of fruit that we are capable of producing, many of our farms may be turned into "Acres of Diamonds."

Question: What price do you get for blackberries and raspberries?

MR. PUTNAM: Down there we get about ten cents a quart for blackberries. We have a market at home, where I am. My red raspberries last season averaged right through the season ten cents a pint. At the last I did sell some as low as seven and a half cents when the peaches crowded them. It gives a very good profit on raspberries, I assure you.

Question: What varieties of grapes do you suggest for Maine?

MR. PUTNAM: I don't know the conditions. I am sure you could plant the Green Mountain in this section and I think the Moore's Early. I rather doubt if you could ripen the Concord in many sections here. For a red grape I hardly know which one to say. Your Experiment Station must be able to give you information on varieties which I cannot give you. The Delaware will ripen early if your soil suits it. The Brighton is the best grape we grow. It is one of those grapes which are self-sterile. That is something you should look out for; they will not fertilize their own blossoms, but must have another variety which is stronger. They produce pollen, but the trouble seems to be that the pollen will not fertilize its own blossom. It requires a different strain to fertilize it, so that the cross fertilization of the varieties you have to look out for. I feel pretty sure for your own use you can grow the Green Mountain. You can girdle them and get them earlier that way. Grow it up about three feet high, and save one long leader each way this year. Next year those two will spring out at every bud with side shoots which will set two to four clusters of grapes. One of these leaders you can girdle when grapes are about the size of peas. If you girdle both of them you will lose your vines; you must have some elaborated sap to store in the roots. Girdle half your vine every year and they will ripen from a week to ten days earlier. You will not get the quality if you girdle.

PEDIGREE FRUITS.

By Prof. C. A. McCue, Newark, Delaware.

For the past ten years orchardists and nurserymen have been hearing a great deal about so-called pedigree fruits. The grower of grains is a believer in pedigreed seeds and the "pedigree" is the fetish of the live stock man. The producer of pure bred live stock points with pride to the long pedigrees which his animals bear. He knows the productive record of the ancestors of his animals for many generations back. He banks his all upon "breed." He is a firm believer in the old adage, "Breed is more than feed." As far as animals are concerned every one agrees that the faith placed in the pedigree is faith well founded. Pedigree is not necessarily a correct indication of an animal's performance and worth; but it is an indication of its probable performance and may be regarded as an insurance against mediocrity. Wipe out pedigrees and our live stock industry would fall into a chaotic condition.

Pedigreed seeds are becoming common. Many up to date grain growers and very many vegetable gardeners are demanding that their seeds have a pedigree. Experience and experiment have proven that they are justified in making such a demand. Pedigree seeds are of a necessity based upon repeated selection of the best and ruthless rejection of the mediocre. "It takes three generations to make a gentleman;" but it takes many generations to make a good carrot. The orchardist and the nurseryman, and especially the nurseyman, have observed with jealous eyes the profits of pedigree breeding in animals and seeds. They have said, if selection and pedigree have done so much for the animal and vegetable industry, why should it not do as much for the fruit industry? If the dairyman can improve his herd by selection from his best producers for breeding purposes, why cannot the fruit grower improve his orchards by taking his scions from trees of known producing powers, and improve his strawberry plantation by taking runners from plants that were high yielders? In short, it has been claimed and preached by many that varieties of tree, vine and bush fruits should have a known pedigree and that such a pedigree would insure betterment in production, quality, vigor, and hardiness of these fruits.

Many well known nurseymen and a few horticulturists of national reputation have endorsed this plan of propagating fruits, while many others, equally as famous, have protested and said that there is absolutely no virtue in it.

We have here a matter of great economic importance to nurserymen and fruit growers. If we can select scions and buds that will give superior fruit, our fruit and nursery business ought to be reorganized along new lines. If we cannot so improve our fruits, we ought to stop talking about pedigree fruits and pedigree nursery stock. The question is of such importance that it ought to be settled quickly one way or the other.

I, perhaps, would better define my own position before going further. It is this: In general, fruit, vines, flowers and other plants are propagated by cuttings, buds, scions, and all other like manner of vegetative reproduction, without the intervention of sex, may possibly be improved by bud selection, but such improvement is rare. I believe that there may be a value in the so-called "pedigreed" nursery stock, but that in the great majority of cases there is absolutely no foundation in fact for the great virtues claimed for such stock. It may appear to you as though I am dodging the issue and trying to play safe, but such is not the fact. I believe unreservedly that as a general practice there is absolutely no virtue in the practice of picking out the best bearing trees in our orchards and propagating from them. I believe that there is nothing of intrinsic value to recommend the practice of cutting scions from bearing trees in order to propagate nursery stock. The ordinary fruit grower is wasting his time in trying to improve his fruit by bud selection.

The value of "pedigree" nursery stock may be proven or disproven in two ways. First, by experimentation, and second by reasoning. Let us glance a moment at some of the experiments which have been conducted to prove the value of pedigree stock, or "bud selection," as we shall hereafter call it.

George T. Powell of Ghent, New York, is probably one of the leading exponents of bud selection in propagating fruit trees. Let us see what he says. "After twenty-one years' experience in the study of bud variation and in using it in the propagation of fruit trees I believe that there is value in the principle and in its application. I have a King orchard that was top-worked upon Spy bodies with scions selected from a tree that stood for thirty years without any effect from disease, especially the canker which is so injurious to that tree. Ordinarily an orchard of King trees, as propagated from the nursery row, become badly broken in from ten to fifteen years. I chose this method to prove the value of selection, and from the one tree which evidently had constitutional vitality and resistant power against diseases above most trees.

"I have at present a King orchard that has not a trace of disease in it, and which has borne sixteen consecutive crops of excellent fruit. I think there is particular value in bud selection and I believe that buds carry with them specific qualities. However, the tree must be well nourished. The two things must always go together, selection and good culture. After thirteen years of work along this line and with three generations of trees so propagated, now bearing fruit, I feel convinced that the principle is correct, and that it is working out not only highly interesting but most satisfactory results."

Let us examine the facts in the above statements: First, the selected buds were all worked upon Northern Spy stock, which is often used as a stock for King trees to avoid certain diseases. Secondly, there is no check to show that buds from other King trees worked upon Spy stock and under the same cultural conditions might not have given equally good results. But even granting that there was value in this certain instance of bud selection, is it safe to draw generalities from this one case? I think not. I do not deny that much good may come from bud selection, but I do maintain that such instances are too rare for us to make a general principle out of the behavior of selected buds in one particular instance. Such instances of valuable bud selection are too rare to advise it as a general practice for nurserymen and orchardists.

Let us look at another case. In 1891, The New York Geneva Station planted an orchard of Rome Beauty. The stocks were all carefully selected Ben Davis, and these were budded to Rome Beauty buds that had all been taken from the same tree. Yet an examination of the records of the performance of this orchard shows a great variation in the behavior and growth of the trees. Prof. Hedrick, in writing about these trees, says, "Experimenters, fruit growers and nurserymen are not distinguishing sharply enough between what is due to 'nature' and what is due to 'nurture.'" In other words, the differences found in the behavior of these trees is probably due entirely to their environment and not to their breeding.

Still another experiment, which I must quote largely from memory as I have been unable to locate the reference: Dr. J. C. Whitten, of the University of Missouri, observed a Ben Davis tree in the University orchards that bore more and better (if such a term can be applied to Ben Davis) apples than any other tree of the variety in the orchards. Dr. Whitten propagated a number of trees from this tree. He also propagated a number of trees from the poorest bearing Ben Davis tree in the same orchard. These trees were planted, alternating in the row, and given the same care. After several years of bearing, no differences could be noted between the trees from the heavy producing parent and the trees from the low producing parent.

A number of reliable growers of strawberries have had considerable experience with "pedigree" strawberry plants and the evidence submitted seems to point to the fact that, as far as the strawberry is concerned, there is no benefit to be derived from selecting runners from heavy bearing plants. Just as good bearing plants can be secured by propagating from runners from plants that have a light crop.

Shamel's work in California with citrus fruits would seem to be in favor of the plan of bud selection. Shamel says: "The most astonishing and striking fact disclosed in our studies, and of tremendous importance in the propagation of citrus trees, is the frequency and character of bud variations in citrus fruits. These are variations in type of trees and fruits such as would come under the head of bud sports or so-called bud mutations. The Eureka Ranch Washington Navel Orange grove of about 150 acres is generally considered the most uniform grove of its kind in the state. The fruit is extremely uniform and there is a complete absence of variable types. This is one reason why the grove was selected for this work. Our study of the trees in this grove has revealed the presence of seven frequently occurring types of the Washington Navel Orange. Five of these types are unproductive, bearing low grade, undesirable, and unproductive fruit. Out of about 13,500 trees we have located about 100 trees of these undesirable types which were rebudded, using buds from select trees of the standard type. These rebudded trees do not represent all of the undesirable type trees present in this grove. Only the most striking and certain cases of undesirable type trees were rebudded. The striking feature of this condition lies in the fact that the trees in this grove were propagated from buds, but shortly removed from the two parent navel orange trees. Bud sprouts as represented in the off type of trees were found in thousands of instances, showing as single branches in otherwise standard type trees, and in our breeding plots where all individual trees are closely studied as single fruits in standard type trees.

"We found many trees in this grove bearing naturally all seven of the general types of the navel orange. Not more than ten per cent, probably less, of the trees of the Standard Washington navel type in this grove are free from off type fruits. This frequent and striking condition cannot be explained on any other grounds than that of bud variation."

Here, indeed, would seem to be an unanswerable argument in favor of bud selection at least for citrus fruits. There is no gainsaying the fact that there is such a thing as bud variation. No two buds upon a tree are exactly alike; all have minor differences. These differences may be caused by an excess or a lack of food, a more favorable position upon the branch, or any of a thousand things. If such variations are permanent and give approximately the same result under all conditions then we have a bud sport. The test of a bud sport is its propagation. We cannot pass judgment upon Shamel's work until we know if the seven types of Washington Navel Orange which he mentions are *permanent* types and if they will "come true" when budded upon other trees. Until this fact has been established we cannot accept Shamel's work as a proof of the value of bud selection in propagating trees. Even though these types should prove permanent we could not accept that fact as proof that bud selection would be the thing to practice in propagating deciduous fruits, such as apples, pears, etc.

The very fact that Shamel found all seven types growing upon a single tree would indicate that his types would fail to "bud true." But we should not judge this work with citrus fruits until it is finished. In dealing with nature it is often best not to prophesy.

Now let us depart from the realms of experimentation and see what reason can do for us in solving this vexatious question of "pedigree" bud selection. In the first place it must be pointed out that the advocates of "pedigree" fruit trees have reasoned from a false premise. They have said: "If there is merit in selecting the best member of the herd to breed from or the best plant in the garden to save seed from, why should we not take our buds and scions from the best fruit trees in our orchard?" Why should we not grasp the benefits of extra quality and heavy production and pass these good qualities on to a new set of trees in a new orchard? There is absolutely no similarity in fact between the first two cases and propagating by buds and scions. In the case of the animal and the seed we have the intervention of sex to reckon with, while in the case of fruit tree propagation by scions, buds or cuttings, there is no question of sex. In the case of seed, we have handed down in the seed a combination of definite characters of the two parents. Since the chance for differing combinations of these characters is great, we consequently expect and do get a great variation in the seedlings from the two parent plants. A bud, a scion, a runner or a cutting is simply a transported portion of the parent plant. Correctly speaking, all the Spy apple trees in the world are simply pieces of the original Spy tree; take them where you may, from Maine, Delaware, Michigan, Oregon or California, and they will still remain Spys.

August Weismann, the noted German scientist, whose decease we noted with regret only a few days ago, was the father of a theory of life that meets with the approval of scientists the world over. Weismann said that all life was composed of two great portions, body plasm and germ plasm. All life has its origin in a simple cell and this cell is composed of these two plasms. One of these, the body plasm, may be modified by environment such as heat, cold, food or other external factors; but these external factors can have no influence whatever upon the germ plasm. All characters that are modified by external causes cannot be passed on to the offspring. Only those characters which are represented in the germ plasm can be carried on from one generation to another. The only way in which the characters of the germ plasm may be permanently modified is by the intervention of sex and the resulting mingling of two different streams of germ plasms. In animals, the germ plasm is centered in the reproductive organs. In plants, it is not only present in the organs of sex but is also, to a great extent, permeates the tissues of the plant. If this were not so we would be unable to reproduce a plant by grafting, budding or cuttings. Some plants show evidence of a wide spread of germ plasm throughout the tissues, while in others its range appears to be greatly restricted. The begonia can be propagated from leaf cuttings while some trees it is hard to propagate in any way other than by seed. Thus we can see that in taking buds or scions from our chosen fruit trees we are simply continuing the old original stream of germ plasm that was in the original plant of the variety. The resulting plants from bud or graft propagation may vary slightly but these variations never fluctuate very far either side of a certain definite type. That is to say, the heritable characters go on from generation to generation of fruit trees without any appreciable fundamental change. We have a great range of variability in the trees, due to external influences upon the body plasm. These variations may take the form of increased production, deeper colors, more vigorous growth, etc., etc.; but such variations are but will-o'-the-wisps, the mere passing whims of nature, who allows the passing wind of environment to ruffle her surface; while, unless sex should intervene, deep down in her placid depths, as represented by the germ plasm, she goes serenely on her way forever and ever unchanged.

I have said that the germ plasm remains unchanged from generation to generation. However, there are in fact two changes that may occur in it. One change is a slight variation from normal. The pendulum of variation may swing to and fro between two pretty well defined limits, but it always swings about a certain center which is the type of the variety. Any propagation from one of these chance swings of the pendulum will not change its course, it will still oscillate in the same path as before and with the same limits of swing. This form of variation is found in all animal and plant life and a new type cannot be gotten by propagating from any of its variations, even the extreme ones.

It is possible that the seven types of Washington Navel orange mentioned above in Shamel's work are such variations. Here the pendulum of variation has swung through an exceptionally wide arc and has given us such widely varying plants. If such should be the case it would be useless to try to isolate any or all of these seven variations for commercial propagation. The fact that Shamel was able to find all seven types upon a single orange tree would lend color to the argument that they were simple unstable variations. The parent bud from which such a tree sprang must have represented one of these seven types, yet it has produced a tree that has varied widely in the fruits and branches which grew from it. Why should we expect any different results from using any buds from trees representing any one of these types? However, time will tell the truth and it may so happen that Shamel is right and I am wrong.

We have a second class of germ plasm variation whereby new characters may suddenly appear and these characters may be inherited. These are the variations that Darwin called sports, a term which DeVries, the Dutch botanist, has since dignified by the term mutations. De Vries has set forth the theory that plants and animals may suddenly and permanently vary by either adding an entirely new character or by dropping an old character in such a manner that the organism appears in a new dress. During this process of mutation the parent type remains unchanged. I question very much if new characters unknown to the parent type are ever added in such mutations, although it is not an uncommon phenomenon to have an old character dropped. For illustration, in the nectarine we have nothing more or less than a peach in which the character of "fuzziness" on the fruit has been suddenly lost. If, on the other hand, we should find a plum that suddenly "took on" the character of fuzziness of fruit we would have a true progressive mutation. I doubt if such a similar case will ever be found.

Variations of the first class, that is, variations that are not heritable, are common, and, as we have shown, it is absolutely time and labor lost to try and propagate new types or new varieties from them. Bud selection of such a character is futile. Yet this is the kind of bud selection that is generally practiced in the production of the so-called "pedigree" nursery stock offered to the trade. Variations due to environment are also worthless for "pedigree" purposes. We must not mistake nurture for nature. A Baldwin apple grown in the mountain regions of Western Maryland might not be recognized as a Baldwin by half the men in this audience. But a bud taken from one of these Maryland Baldwins and grafted on a Maine Baldwin tree would bring forth the type of Baldwin that you all know.

Stable variations in the form of sports may occur; but the crucial point in our argument against "pedigree" nursery stock lies in the fact that as far as our common fruits are concerned, they seldom occur. Lucky indeed is the man who finds and recognizes a true bud sport. Allow me at this point to quote Hedrick of the New York Experiment Station. He says: "For several years the speaker has spent much time in studying the histories of varieties of fruits. In the 'Grapes of New York' he has had to do with about 1500 grapes; in the 'Plums of New York,' 2000 sorts of plums; in 'The Apples of New York,' with about 700 kinds of apples. When this knowledge of thousands of varieties of fruits is focused, one sees in fruits stability and not variation. The generations of varieties of fruits do not change."

The Rhode Island Greening of today is the Rhode Island Greening of our grandfathers. True it is that there may be strains of some of our commercial varieties. We recognize more than one strain of Baldwins, there are perhaps two slightly different strains of Rhode Island Greening, and there are probably two distinct strains of Keiffer pears. Yet when we take into consideration the countless thousands of buds of these varieties that have been taken for propagating purposes, we cannot help concluding that any heritable changes in the germ plasm of these fruits are *very, very* rare; so rare, indeed, as to render the term "pedigree" fruit a catch phrase founded upon unsound principles. The J. H. Hale peach may be a true germinal variation of the Elberta. Time alone will tell.

To conclude, I will again state my position in regard to the whole matter of "pedigree" fruits. I believe that as a general principle for commercial practice there is absolutely no virtue in the practice of picking out the best bearing trees in our orchards to propagate from. I believe that from either a commercial or a scientific point of view, there is nothing of intrinsic value to recommend the practice of cutting scions from bearing trees in order to propagate nursery stock.

Every fruit grower and every nurseryman ought to be constantly on the watch for variations in fruit that give promise of improvement over the parent variety; but he should be very careful not to confuse the influences of environment with the influences of heredity. And he should not forget that out of the many millions of buds produced by any variety of fruit, the bud whose variation has its origin in the germ plasm is a rarity.

"Pedigree" nursery stock is a catch commercial phrase and the claims of nurserymen offering such stock for sale should be given absolutely no credence by the fruit grower.

VALUE OF HOME ECONOMICS.

By Prof. Frances R. Freeman, Orono.

I think we may consider in the first place the things that we teach in home economics. Perhaps it is not quite clear to all of us. In one division we may say we have the applied subjects, that is, the cooking and sewing, household management, sanitation, and so on. In what we call cookery, we consider the nutritive value of foods, their composition and the methods underlying their preparation, and also in dietetics the selection of the proper food, dependent on the age of the person, the work in which they are engaged, etc. We also do some work in the care of infants and infant feeding.

Then in sewing we teach the practical work—the selection of materials, the proper colors to be combined in clothing, and their hygienic values. We study the household management, the division of income and the budgets proper for the various expenditures of the house; we do something with the servant problem, take up the serving of meals and the various processes of laundering, sweeping, dusting, and other household duties. And we also study the sanitation of the home as well as its structure, the planning of the house, its decoration, the buying of the proper furniture, wall paper, carpets and the like.

In the other division we might put the fundamental sciences,—the fundamental subjects to be taught in other departments with relation especially to our own work. We have chemistry, bacteriology, physiology, physics, sociology and economics which are perhaps the most important, and of course the girls take English and a foreign language, as well as a number of other subjects, as their time will permit.

We have broadened the scope of the work very decidedly since the beginning of home economics. In the first place, I think the people were interested primarily and fundamentally in the individual family, in the individual home. But the work of the National Association of Home Economics has been broadened. It is not only interested in the individual family, but it is interested in the larger families which we find in the various institutions. It is interested in the country and city community. It is interested in the state and in the nation, in the state laws that we have regarding food adulterations, for instance, sanitary laws, laws governing public health. And the scope of its activities has been widened. In the first place, the only work that was done, we might say, was in the college, or the university, a school of that type. Now it has gone out from these institutions to the entire community. I think that perhaps we are doing just as great a work, if not greater, in the great movement that has been started within the last five or six years in carrying this information to the entire community. Of course that work is being supervised by the various extension departments.

Now there comes a question as to why we are teaching home economics, why it is put into the school curriculum, and why women should know something about this work any more than they should have done a great many years ago. With the great industrial evolution and the great factory system being developed, the home became less and less a producer and more and more a consumer. The industries that were formerly carried on in the home are now being removed and have been removed constantly. We do not have the spinning and weaving. We do not know anything now about the materials that we buy unless we have the training and the knowledge to judge those things,— unless we know the conditions under which they are made, while formerly the woman absolutely controlled all those things. She knew that she had cotton or wool. She knew under what conditions it was made, for that work was carried on largely in the home or in small communities which worked together.

Then we have had, with the great change in the industries of the home, a great change in the economic position of woman. Woman has gone more and more from the home into factory conditions, into factory work. These things have changed the social conditions of our homes. The family is no longer, perhaps, so much a unit in a certain sense as it was at one time. Our interests are varied. The woman is interested in one thing, the man in another, and the child in another, and each one seems to be pursuing his own special interests. So that with this removal of industries, with the removal of the women especially in the factory districts from the home and with the great changes that have come in the social activities of the family, the child, it seems, does not have the opportunity to learn how to cook and how to sew, and to learn the fundamental things that a girl should know. She does not have the opportunity to learn those things in her home and so naturally it has fallen into the school curriculum. And of course our ideas of education have changed very decidedly in order to make it possible for us to teach this work and put it on the same basis as the other courses of study that are given. So with those things in mind as to why we put it in the schools, we may consider why each woman, each girl, should know these things. Regardless of all the extreme things that we hear, and the extreme experiments that have been made in co-operative housekeeping, etc., the home or the family still remains the social unit and undoubtedly it always will, and we judge that home by the social product which it puts out, by the individuals which come from the home, and of course the most important one for us to consider is the child.

The people as a whole, the community at large, has agreed, I think, that a home should maintain its members in such a condition of health and happiness, and morality also, that they will be able to do the most effective work possible for the greatest number of years. Now the fundamental things, of course, in order that a person may be the very best member of society and do the best work, are food, clothing and shelter. We go right back to the primal needs of the human race. It was, and it is still believed, I think, by a great many people, that a woman does not need to have any definite training in order to know how to keep house, that she just knows it any way. We had that same notion as regards farming. But we have gotten over that quite largely and we are coming to the same conclusions about women, that housekeeping is not a haphazard affair, that people have to know. Now it is true that there are very good housekeepers and cooks who never had any home economics. But these people had their training in some form and they learned those things in some definite way which was the training for that age. But women must be trained to the conditions of keeping house, of cooking, and because a woman is much more a consumer now than a producer, she must know the fundamental principles of health, the selection of foods, the selection of clothing, and the necessary sanitary conditions. So she needs to be trained in selecting the clothing for her family. She needs to know the clothing that is most healthful and hygienic. She needs to know whether the material is adulterated or not; whether she is getting what she pays for, and she certainly ought to know the factory conditions under which it is made. She ought to know the sanitary conditions of that factory, and she ought to know the number of hours that those people who are employed there are working. She ought to be interested very decidedly in the labor conditions of the women and the children who are producing these things.

When it comes to food she ought to know food values. She ought to know the best way to cook those foods and the best ways to combine them. She ought to know the amount of food that a child in school needs and she ought to know the proper food to feed that child as well as the older members of her family, or the infant in the family. And the same thing is true here of knowing the conditions under which the food which she buys on the market is prepared and the conditions under which it is sold. She ought to know the value of money. She ought to know how much to pay. She ought to know that cheaper cuts of meat properly cooked are just as good as the more expensive cuts of meat, that they are just as nutritious. She ought to know how to prepare these cheaper types of food and save in that respect. She ought to know that not only does the house or the home show the character of the people who live in it, but she ought also to know that that home, that house, is going to modify very decidedly the characters of those people. We are influenced by our environment. We cannot control it entirely, no matter how hard we try. So she ought to know how to plan a house most conveniently, to be the most helpful, to be the most efficient. She ought to know the kinds of furniture to buy that are beautiful and artistic and useful. And she certainly ought to know the conditions that exist in the neighborhood that will affect the sanitary conditions of her home, and she ought to know how to keep it in a clean and healthful way. Those are just some of the very fundamental things that she ought to know.

And then we need more efficient home management. We need to know how to plan our house, how to keep house, how to cook and how to sew, with all the incidental things that go along with it. We need to know how to manage our homes. We have the farm experts now who are telling the men and giving instructions in farm management and the men are getting their farming upon a scientific basis. It is time the women got their housekeeping upon a scientific basis. Very, very few women keep any household expense accounts at all. They use no business methods. Now they need to keep accounts; they need to know definitely how much money they can afford to spend for clothing or for food,—how much they ought to spend, and then they should live within their means. And they need to plan their work and not go at it in any haphazard sort of way. We need the scientific business principles applied in our keeping of budgets and the planning of our work, and we need to use the best machinery in our homes that we can get. You know it seems to be one of the characteristics of a woman that she will get along with any old thing in the house. The man does not do it. He buys the best farm machinery; that is, the most of them do. He buys the thing that is efficient, that he needs to do his work. Women work along with the same old things that are not efficient, that will not do the work and meet the demands made upon them, and say nothing about it. They should know the proper things that they need in their homes to carry on their work efficiently, and then they should have the initiative to get them. Women lack initiative in a great many respects,—it is so much easier to let things go on than it is to hurry around and get the things that down deep in their hearts they know they need. They just put it off until tomorrow. This is the case, I think, very, very often. The household is a profit concern in the same sense that a business is a profit concern; but the efficiency of the home is measured by the amount of comfort and satisfaction which it will bring to the members of that family, and by its social efficiency as to whether it turns out good members of society or not, and as to whether those people are capable of earning a living and doing their share in the industries of the world. A competent manager should understand all the principles of the business which she is running and a woman should know some sociology and economics. She should know the fundamental things which make for the most efficient person, mentally and morally.

Of course the physical, material things are fundamental, they are of primary interest in every household. But they are merely the basis for the expression of human nature, and I think it is time that the women get their work so planned that they have the information which will broaden their views of life and their outlook and whenever they do that, work and housekeeping are going to become less a drudgery. It is always true that when we know the whys and the wherefores of things, when we have the knowledge of the work we are doing, it becomes less a drudgery. It does not mean there is less work but it is less a drudgery. And the women, and especially the foreign women of the country, need to have the drudgery of their work lessened, so that they will have, as Miss Caroline

Hunt says, more time for just the mere joy of living. And Miss Arnold put it very emphatically at the national meeting of home economics this year when she said: "We talk about efficiency all the time. We need efficiency, but it is time that we talked less of efficiency and more of the real thing, human life." And that is certainly true, but we are only going to get that through the learning of these fundamental, physical things. I think Emerson sums up the whole thing when he says that "A house should bear witness in all its economy that human culture is the end to which it is built and garnished."

CONCLUSIONS FROM THE FIRST GREGORY CONTEST.

Hon. A. K. Gardner, State Horticulturist.

(Stenographic Copy.)

Most of you are more or less acquainted with the first contest in the Gregory prize, perhaps better known as the Carleton prize. You know in 1909, Maine, through the work of Mr. Hitchings and Mr. Yeaton, made an exceptional showing at the New England Fruit Show in apples and because of that showing and because of the business relations that he had had with the State of Maine, the late Mr. Gregory of Marblehead offered a $1000 bond to the State of Maine. The interest on this bond every five years was to be given to the farmer producing the best orchard five years from setting. So that the first orchard was planted in 1910 and judged in 1914. This bond was a five per cent bond, so that the interest would be $250. Only $200 of this money was to be used as a prize, the remainder going to pay part of the expenses of the people who judged.

In addition to the $200 premium offered by Mr. Gregory there were other premiums offered by various concerns doing business in the state and a premium by a friend, so that the total aggregated about $800.

There were about 178 men scattered through the various counties of the state that entered this contest, and while some of them have dropped out, there are over 100 that have completed the five years' work. The others of course have completed the work, but we haven't any record of their orchard management.

There are some points of interest in regard to the work that they have carried on. There were—as near as can be estimated—about 7000 trees entered in the contest. Some of the orchards were more than an acre, and some of the orchards didn't quite come up to an acre, so perhaps 7000 trees is as near an estimate of the total number as you can get.

Now, of this number, using 7000 as a basis, about 15 per cent died in the first four years. That is a large quantity, unnecessarily large. Of this 15 per cent, 5 per cent only, and that is stretching it to the limit, died from what we might call unfavorable conditions,—winter killing largely or failure to start. Ten per cent died from what is simply lack of care or lack of foresight. Quantities of the trees died from mice, because people did not protect their trees with tarred paper or wire, or something of that sort.

The members of the department went to these trees from time to time, and offered the owners what advice they could. In most cases, of course, it was not accepted, and perhaps it is just as well for the orchards that it was not. But the main thing that we have to consider in the first contest, so far, is that the people do not take the care in it that they should. The trees as we found them in some of the better orchards were almost perfect. You could not ask for better trees. Some of the trees in one orchard calipered over four inches, and you can think of some of those Wolf River apples down there and you will get some idea as to how big the butts of those trees were. Many trees in the contest did not caliper more than 1½ inches, under practically as favorable conditions.

The soil conditions as we found them in the various localities were much the same. The trees were practically all planted on a rather light loam; and the slope conditions and other things were a good deal the same in each case.

The judging of the orchards was begun in August this year and continued for eleven days. Last year Mr. Sweetser and myself scored a number of the orchards from a score card that we had made up. We wanted to eliminate as many as possible of those orchards that did not have a chance, and we wrote to the various growers, giving them the score and asking that we be freed from coming to their orchard at this time, mainly on account of expense. So when the time came for scoring we succeeded in getting down to about sixty orchards, the fifty scoring highest last year and about ten additional that we were unable to visit.

The score card that we used, I think, should require some explanation. The first thing that we considered in going to the orchard was the general appearance of the trees. And we considered that the general appearance should be perhaps the governing factor, as against pruning and some other items. Of the general appearance, the first thing we considered was color. Of course we figured that the culture methods that had been carried on would be demonstrated pretty fully at least for one season in the color, so that it was of sufficient importance to give a credit of 75 points on the basis of 1000. In judging color we took what we believed to be, as near as we could tell, the best color for the variety and judged accordingly. Color was given 50 points and size 25—color and size together 75 points. In the size, we thought that size for variety should be considered; also the fact that if trees were set as two-year-olds they should be given a little higher standard than trees set as whips. That was figured on as near a mathematical basis as we could get. The first thing in size was uniformity, taking the largest number of trees that were practically the same size as a basis, and scoring the others in proportion. The caliper was scored by taking the actual caliper of each tree about a foot from the ground. It seemed that was as near the ground as we could get a uniform caliper for various conditions in various trees. That was figured out mathematically. The diameter and height of the head were figured in the same way, and in each case, after we had scored a variety, we figured as nearly as we could what a standard should be. We did not place the standard as the largest tree, but as a tree that every man with good care could reach. For instance, I spoke of a tree that calipered over four inches. The standard for that variety, which happened to be a Stark, was three inches, within the possibilities of practically all the trees, provided they were given good care.

Another point that was considered in the general appearance was space. We believed it was of the utmost importance that trees be given enough room in the orchard. That is, a Baldwin tree should be scored off if it was set 25 feet each way, and a Spy tree should be figured in much the same way, and we established a standard, covering the different varieties. Ben Davis and Wealthies and varieties of that type, of course, could be much nearer together. That was given a basis of 75 points. Then we figured a little bit on alignment, not very much, 25 points on a 1000 basis.

After the general appearance, we put in the score card what we term condition, and under that we had freedom from mechanical injury, such as scars from lack of care in pruning, or running over it with a harrow or plow or some instrument used in the orchard work; freedom from insect injury, which of course included all insect injury; freedom from disease injury; and maturity of the wood. We believed we were justified in putting in a score for maturity of the wood, inasmuch as winter-killing depends almost entirely upon it. That was judged purely by the appearance of the foliage, by the condition of the outer twigs, and by the cultural methods that were being carried on; that is, whether or not there was anything being done to check the growth of the tree.

Under pruning we had some difficulty. It seemed quite a job to get pruning in and give it the right balance to the rest of the score card. We finally adjusted it by giving correct cutting a score of 150 points and in scoring correct cutting we considered training the tree and pruning the tree. It is pretty hard to tell where pruning begins and where training leaves off. But we did not feel that a tree that was not trained properly so as to have a strong framework for holding up the fruit should be given full credit, even providing it had been thinned out pretty well.

Then the last item was cost and, inasmuch as our figures were of not very much value—at least as there had been years when it had been almost impossible to get any—we considered the best thing to do was to give it a very small count and perhaps give every man perfect. This report will come in bulletin form very shortly for the benefit of the men that are going into the contest the next time, and we have included in the report some things that may be of value to the man that is starting an orchard, including the distance apart of trees of various varieties, and how many trees it requires per acre set at various distances.

After we completed scoring we found that the prizes had been awarded practically as they are on the chart. Mr. Hobbs, first, with an orchard in Knox county; Mr. Dolloff, second, in Cumberland county; Mr. Morse, third, in Oxford county; Mrs. Bragger, fourth, in Penobscot county; Mr. Hescock, fifth, in Piscataquis county; Mr Bearce, sixth, in Oxford county, and Mr. Morrell, seventh, in Waldo county. You will see that the orchards winning the prizes were pretty well distributed. Oxford county was the only one where two orchards were located. There should have been eight prizes awarded, but one of the concerns had some special requirements and they were not lived up to well enough, so that the prizes could be awarded. It is hoped that that prize can be carried over to the next contest.

I have tried to get as near as I could the costs that were entailed in producing the orchards that won prizes and, while the figures are not perfect, while they are not complete, they do show some things that may be of interest and may help the person that is starting next time in estimating about what it is going to cost to carry on the orchard.

In the first place, most of these orchards were carried on with a system of cropping. The first, second, fourth and fifth were carried on practically the entire time with some crop. The third orchard was carried on practically with a mulch, after the first year, I think. The last orchard was carried on by strict cultivation, just plowing alongside the trees and keeping a narrow strip cultivated, increasing that strip each year. Most of these orchards were sprayed four years, some of them were only sprayed three years, and all but one, I think, were sprayed four years. The owners used various materials, most of them, arsenate of lead, and many of them, lime sulphur; of course, for the aphis there were various materials,—practically all the materials that we use for that purpose. The Bragger orchard was set as whips and the others were all two-year-old trees.

Tables Showing Yearly Expense Items.

1910.

Name.	Cost of trees.	Cost of setting.	Fertilizer.	Care.	Total cost.	Season's Crop. Net.
Hobbs	$ .50 13.50	$3.38	-	$2.02	$18.90	$27.675
Dolloff	.30 13.20	2.20	-	1.32	16.72	52.80
Morse	.35 14.00	-	-	-	-	-
Bragger	.08 3.20	2.80	$1.00	2.80	9.80	13.00
Hescock	.39 18.17	2.50	-	1.50	22.17	-
Bearce	.36 15.84	3.20	-	2.40	21.44	61.40
Morrill	.28 8.40	1.20	.52½	.75	10.80	12.75

Now on the first sheet, the first item is the cost of the trees. Looking down through the column it looks as if the trees cost very much the same all the way through, but that must be considered not as an acre but as a certain number of trees. For instance, in the first orchard, there were 27 trees on the acre, each tree costing fifty cents. In the second, 44 to the acre, or 30 cents. In the Bragger orchard the whips cost only eight cents each. As near as we could estimate, these trees (Hescock) cost 39 cents with 48 trees to the acre; and they cost 36 cents in this orchard (Bearce) and 28 cents in the other (Morrill).

The cost of setting varied quite considerably. In fact, I can't understand why it should vary as much. For instance, 27 trees in one orchard cost $3.38 to set, while in another 30 trees cost $1.20. There were three orchards with practically the same number of trees varying a good deal in the cost of setting. The others did not vary as much. The cost of fertilizing in some cases was kept separate from the crops, but in most cases it was carried on with the crop and nothing was charged against the orchard, so that we do not have a complete record of the fertilizing cost. The cost of care included what pruning was done and any of the work carried on in the orchard that year.

The total cost of the trees for the first year varies of course largely in proportion to the cost of the trees themselves. The "season's crop net" as it has been given to us,—was the cost of producing the crop and the fertilizer that was applied, and the nets that they received from the crops. You notice that that varies quite considerably. These orchards I think that year were all under cultivation with a crop.

1911.

NAME.	Fertilizer.	Cultivation.	Pruning.	Care.	Spraying.	Mulch.	Other costs.	Total.	Season's crop, Net.
Hobbs	$1.35	-	-	$2.70	-	-	-	$4.05	$47.25
Dolloff	-	-	-	1.32	$ .88	-	-	2.20	81.57
Morse	-	-	-	-	-	-	-	-	-
Bragger	.30	$1.00	$ .10	-	2.50	-	$ .10	4.00	13.00
Hescock	1.13	1.00	-	-	.50	-	-	2.63	.62
Bearce	-	-	.20	-	-	-	-	.20	90.00
Morrill	.53	.45	.15	-	-	$ .15	.07	1.35	1.50

This sheet shows the second year of the contest and we have fewer figures for this year than we have for any of the others. In no case are all the costs brought down and they have been estimated as near as the grower could estimate them. The cost of fertilizer varied somewhat as did the other costs on the sheet. Here we begin with the spraying cost. You see three of the orchards were sprayed the second year of the contest. One orchard, the last, was mulched—cultivated first during the season and a light mulch applied late in the fall as a protection in the winter. The costs that year per acre did not vary materially, but here again the costs, if you figure them for individual trees, varied quite a good deal. You see the cost of this first acre was $4.05, this acre down here only twenty cents. The variation of the crop nets is of course very noticeable and depended quite a good deal on the crop. I do not know what that 62 cents net was. I think probably it was grain. That sheet is not of very much importance.

1912.

Name.	Fertilizer.	Cultivation.	Pruning.	Spraying.	Grafting.	Mulch.	Other costs.	Total.	Season's crop, Net.
Hobbs	$1.35	$1.02	$ .34	$ .67	-	-	-	$3.38	$20.25
Dolloff	-	-	.44	3.08	-	-	-	3.52	107.36
Morse	2.70	1.50	-	-	-	-	$1.50	5.70	-
Bragger	1.00	-	.15	2.50	$1.25	$3.75	.15	8.80	5.00
Hescock	-	-	-	1.50	-	-	.50	2.00	5.55
Bearce	-	-	.44	1.32	-	-	-	1.76	33.00
Morrill	.60	1.50	.30	-	-	.60	-	3.00	2.10

The third year we began with larger pruning costs—perhaps not larger pruning costs but more people began to prune their trees, and the cost does not vary as much. The cost in three orchards, for instance, is a cent per tree, in another it is half a cent, and in still another it is a little more than a cent per tree. That is figuring probably about three minutes for a tree for pruning. Cultivation was charged in two cases; one orchard was grafted that year—that is, the whip orchard—and that was the beginning, I believe, of the mulch system on this particular orchard. The mulch cost, for 31 trees, $3.75, a little better than ten cents per tree. The totals that year varied considerably.

1913.

Name.	Fertilizer.	Pruning.	Spraying.	Cultivation.	Mulch.	Other costs.	Production.	Total.	Season's crop, Net.
Hobbs	$2.02	$ .84	$1.35	$2.70	-	-	-	$6.91	$55.35
Dolloff	-	.66	1.76	1.32	-	-	-	3.74	105.86
Morse	2.00	.25	1.60	3.75	-	$2.40	-	10.00	-
Bragger	1.40	.60	2.25	.50	$3.00	.75	-	8.50	8.00
Hescock	.53	.50	1.50	-	-	-	-	2.53	13.17
Bearce	-	.44	1.00	-	-	2.08	-	3.52	42.00
Morrill	.48	.24	.36	.12	.60	.60	1 pk.	2.40	2.10

This is the fourth season, sheet—1913. This year the pruning was charged in each case as well as spraying. Every orchard was sprayed last year. The cost for pruning increased a little, but not materially. One increased from a little over a cent to practically three cents, another to a cent and a half, and another one to two, and the others in something the same proportion. The spraying cost increased largely because of the work of the aphis in that year. The mulch system was continued in the Bragger orchard, and was reduced somewhat. The Dolloff orchard this year was in sweet corn. That is a pretty good record for the acre, outside of the trees, $105.86 net. That is an exceptional year. The first orchard was cropped with various truck crops, as was the fifth and sixth. The first fruit, on these prize winners at least, was gathered last year, one peck of fruit from the Stark variety in the Morrill orchard. There were records of fruit from other varieties before that,—from the Wealthy and the Transparent and perhaps from other apples of that type.

1914.

Name.	Fertilizer.	Pruning.	Spraying.	Cultivation.	Mulch.	Other costs.	Production.	Total.	Season's crop, Net.
Hobbs	$2.70	$1.02	$1.35	$3.38	–	–	2 bu.	$8.45	$40.50
Dolloff	–	1.76	7.04	1.76	–	–	7¾ bu.	10.56	77.44
Morse	4.00	1.60	2.20	1.00	–	$2.00	1 pk.	10.80	–
Bragger	1.55	.31	3.72	–	$ .93	1.55	3½ bu.	8.06	4.00
Hescock	8.25	1.00	2.50	–	–	1.00	½ bu.	12.75	40.00
Bearce	–	.44	1.00	2.40	–	–	–	3.84	14.50
Morrill	.90	.60	.45	.45	–	.15	3 bbl.	2.55	2.10

The last year of the contest is much the same as the year before, although many of the costs increase materially, especially pruning, the cost advancing quite a good deal. Pruning and spraying, cultivating and mulch, throughout the sheet, are very similar to the one before. That is the last year of the contest.

Table Showing Comparative Nets and Costs of Single Trees.

Name.					
Hobbs	$41.69	$191.03	$149.34	$ .31	$1.54
Dolloff	36.74	425.03	388.29	.17	.84
Bragger	39.16	43.00	3.84	.25	1.26
Hescock	42.08	59.34	17.26	.18	.88
Bearce	30.76	240.90	210.14	.14	.70
Morrill	20.18	20.55	.37	.13	.67

There are some totals that are of interest. In the first place the total cost runs very uniformly throughout, that is, the cost to the acre, with $42.08 as the highest and $20.18 as the lowest; but outside of that one orchard the cost run very close. The total nets, of course, as might be expected, vary considerably. The largest net for the five years of operation in this orchard was $425.03,—that is about $80 or a little better per year. In some orchards with the smaller nets, only hay has been taken off in the last three years. The cost per tree per year did vary, however. In the first orchard, the actual cost, as near as it could be found from the average cost for the five years, was 31 cents per tree and varied from that to 13 cents per tree, with perhaps 17 or 18 as a close estimate for the average. I think Prof. Sears, in his report on his own orchard of 108 trees per acre, gives the average cost per tree per year at something around 25 cents, and it is surprising that under conditions of the Gregory orchards this should come even as close. The total cost per tree for five years, as given in the last column, varied from $1.54 to 67 cents. Even taking into consideration the different methods of orchard management, there should not be that variation. Probably the first orchard has been figured rather high. I have no doubt it has, because the figures have been lumped each year and they have been uniformly higher than in any of the other orchards, and I don't believe the man really has put in the time that would be indicated. Of course some of these figures are extreme estimates. I wrote one man in regard to the pruning of his orchard in 1911, and he wrote back that he thought perhaps $1.50 a year would cover his pruning; $1.50 a year would mean, he put in about eight hours each year pruning his orchard of an acre in those small trees. Of course that was entirely out of reason. Nobody in the contest put in that much time. Most of them didn't put it in during the whole contest.

I would say that in our scoring, in addition to the seven prize winners, there were about twenty more orchards that scored over 900. Perhaps 150 scored less than 900 on a basis of 1000.

Now just a word in regard to the second contest. The application blanks for this contest are available now. We have some here and any man may obtain one by writing to the Department. They are just simply application blanks to be filled out and sent to the Department, stating that a grower wishes to enter the contest. It is the plan now to send out at the beginning of each year the cost sheet, to be filled in as the season advances, by the grower himself—probably two sheets, one for the actual cost of the work done on the trees, and the other for his cost in his cropping system, so that the cropping system may be kept entirely separate from the trees themselves. You understand that this contest has a two-fold advantage. It has the advantage to the grower of competing for a prize or a series of prizes; and it has the advantage to the Department, and of course to the other growers who are not contestants, of finding out the net cost of producing an orchard for five years under different conditions and with different varieties handled by different men. Those figures can be made of much value to the people of the state and perhaps to growers outside the state. In order to do that we must have accurate cost, and it is our plan this time to perhaps apply enough red tape to get as near as we can some good figures. We realize the trouble with these figures is that they are not accurate, and what we want to find out is the exact cost entailed, and we have drawn up some regulations to be filled by the people who wish to enter next time. These regulations are in the rough at present. We plan to have a report sheet sent out to each grower at the beginning of each season. We took the liberty to put in a score card, inasmuch as most of the growers this time did not know what the items to be considered were, so that they did not know where to put in most of their time any more than to carry their trees as well as they could. We have put in a score card very similar to the one we used, which proved very satisfactory, except in this case we have increased the cost to a basis of 75 points so that it will have quite a good deal of weight in deciding which orchard is the best.

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