MAINE STATE LEGISLATURE

The following document is provided by the

LAW AND LEGISLATIVE DIGITAL LIBRARY

at the Maine State Law and Legislative Reference Library

http://legislature.maine.gov/lawlib

Reproduced from scanned originals with text recognition applied

(searchable text may contain some errors and/or omissions)

PUBLIC DOCUMENTS OF MAINE

1912

BEING THE

ANNUAL REPORTS

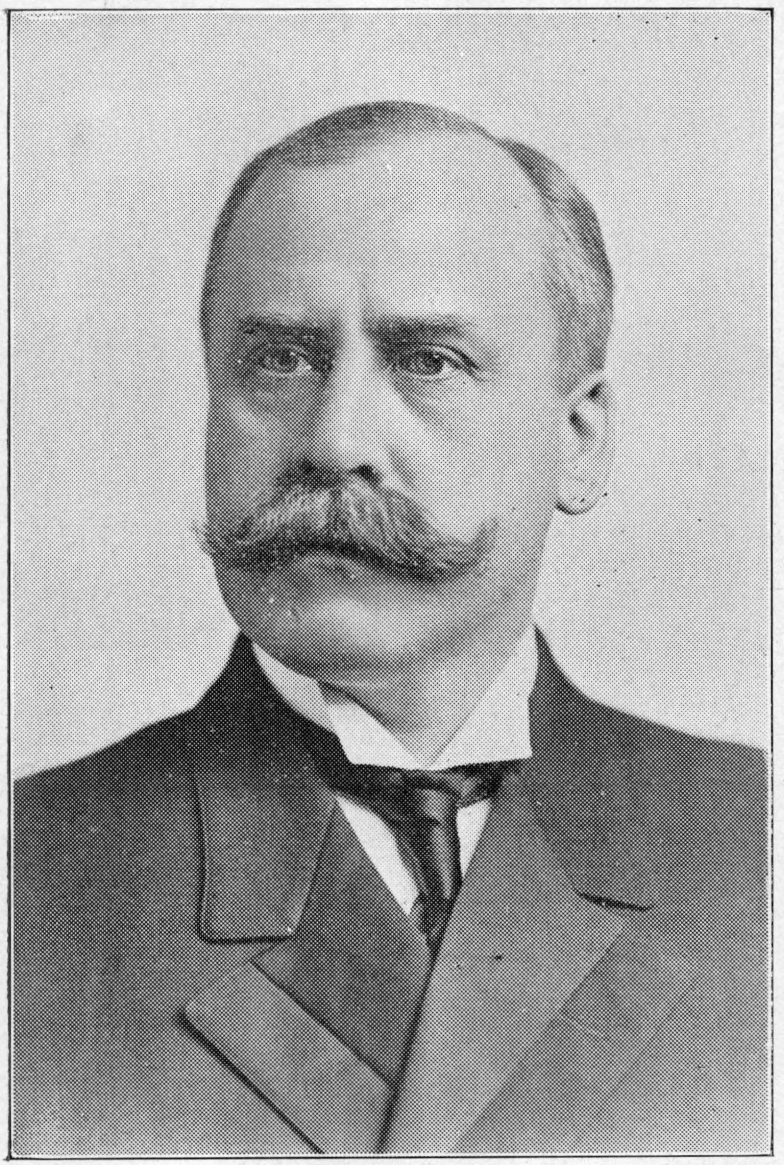
OF THE VARIOUS

DEPARTMENTS AND INSTITUTIONS

For the Year 1911

VOLUME I

AUGUSTA
WALLACE S. LADD PRINTING COMPANY
1912



Governor Frederick W. Plaisted, a Friend to Agriculture.

AGRICULTURE OF MAINE

TENTH ANNUAL REPORT

OF THE

COMMISSIONER OF AGRICULTURE

OF THE

STATE OF MAINE

1911

WATERVILLE
SENTINEL PUBLISHING COMPANY
1912

DEPARTMENT OF AGRICULTURE.

To His Excellency, Frederick W. Plaisted, Governor of Maine, and Council:

I hereby submit my first annual report as Commissioner of Agriculture of the State of Maine, for the year 1911, in compliance with chapter 204 of the Public Laws of 1901.

J. P. BUCKLEY, *Commissioner.*

Augusta, December 31, 1911.

ANNUAL REPORT OF THE COMMISSIONER OF AGRICULTURE.

The year 1911 has been a very successful one to the farmers of Maine. Farming is an industry of great importance to this State, as this is an agricultural state, and one of our largest incomes is from the products of the farm. Our farmers are taking up the question of putting their crops on to the market in better shape, and co-operating in the selling of their products and the purchasing of their supplies, thus getting better prices and conducting their farming in a more business-like manner, which will mean millions of dollars to this State in a short time and put our State in the front rank in agricultural pursuits. The farmers must not depend too much upon the dealers from outside the State to conduct their business, as they can do it to a large extent and thereby keep up the reputation of our State and bring home to the State and her farmers abundance of wealth and prosperity.

The demands of the consuming population of this country are on the increase and many are turning back to the farm. There are great opportunities in Maine to develop agriculture, as there are thousands of acres of valuable land that could be put under cultivation at a very small expense, the soil being very productive as shown in the different crops that have been raised the past year. One of the greatest difficulties is for the farmer to get a fair price for his farm products, as there are too many middlemen and many of them dishonest and taking every advantage of the farmer, and this makes it expensive for the consumer. The average consumer has an idea that the farmers are getting wealthy at the present cost of the food that is consumed, but it is not so. Statistics tell us that the farmer does not get 30 cents of the consumer's dollar. This question will interest the consumer as well as the producer.

CROPS.

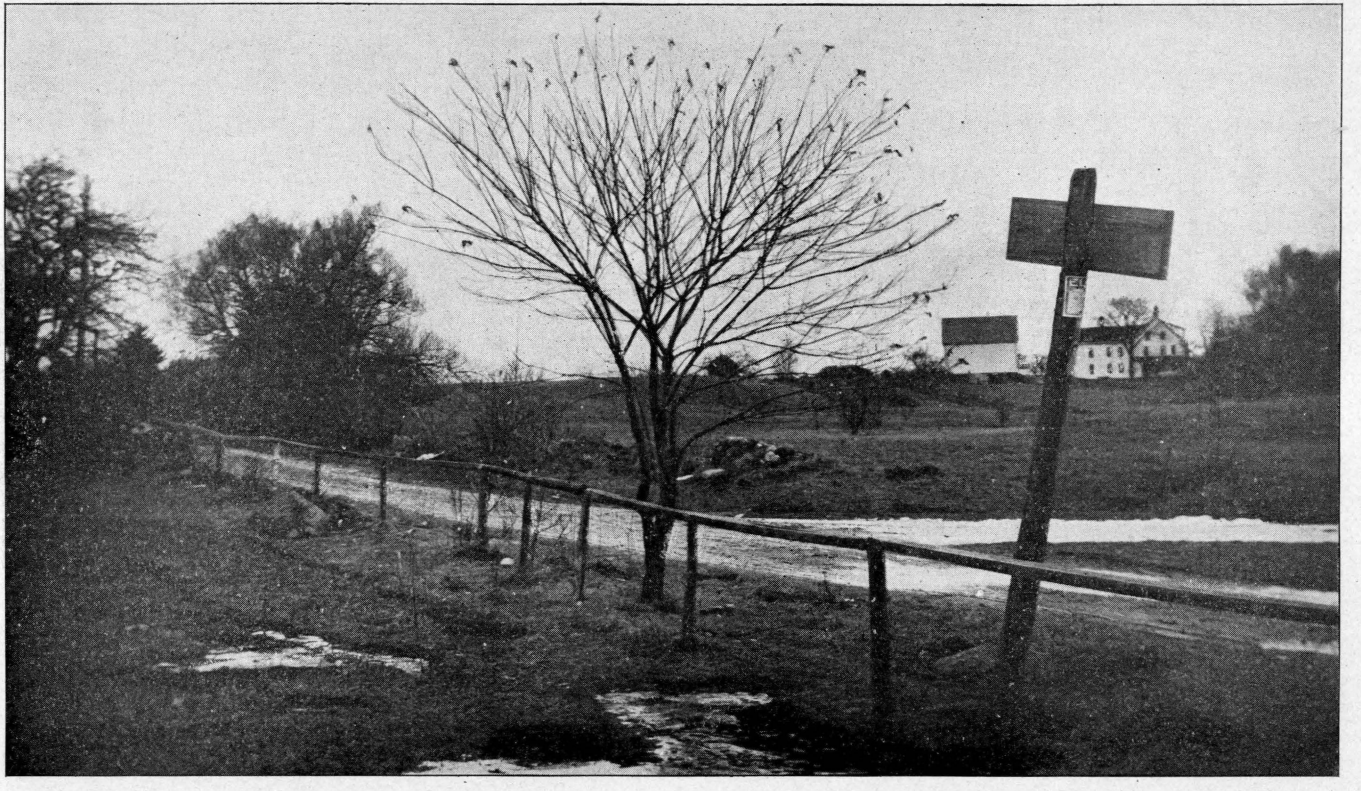
Though the season was not favorable, as we had a very light rain-fall for the year, the crops did remarkably well.

Potatoes. Our potato crop takes the lead, and with a short crop in other parts of the country, the farmers received a good price for their potatoes. Nearly 30,000,000 bushels of potatoes were grown in this State the past year, including those consumed in the State. The average price was over $1.00 per bushel, thus giving over $30,000,000 for the potato crop alone. There was a great demand for potatoes for seed as well as for commercial uses, and our potatoes are used for seed in many parts of the United States, and are considered the best seed that can be planted, thereby giving many of our farmers an advanced price for seed potatoes.

Hay. The crop of hay was not especially large, but owing to the shortage in other parts of the country the value of the crop was estimated at $31,500,000. The average price received was about $14 per ton, but a large portion was consumed in the State, thereby assisting in keeping up the fertility of the farms. A large part of the hay consumed was turned into dairy products, and a portion was used in raising beef and dairy cattle, sheep and horses. This year quite a lot of hay was sold in different parts of New England, as the crop was short in almost all of the New England States.

Apples. Our apple crop this year was about 3,000,000 bushels, at an average of 75 cents per bushel, making $2,225,000. This crop can be improved, as the orchards must be cared for so that we can raise better apples and demand better prices, and add to the wealth of our State. There is no question about raising apples,—the problem is to raise better apples and get better prices and build up our reputation as a State producing good apples and putting them on to the market in the proper shape. This part has been neglected and I know of no other way in which the value of our Maine grown apples can be more increased than by the proper packing and the proper marketing of our apple crop.

Oats. The oat crop of this State was estimated to be worth $1,500,000. Owing to the high price that oats have brought in the market we were able to sell a large amount for seed, which



Brown-tail Moth Nests on Tree in Town of Wells.

brought our farmers very good returns, as our oats are considered very valuable for seed and command a high price.

Sweet Corn. Our sweet corn crop was the largest ever produced in this State, there being packed in the different factories of the State over forty million cans. That gave the farmers $1,025,000 for their sweet corn crop. Though the early frost cut off a large amount, it was without question the largest sweet corn crop ever raised in Maine.

Field Corn. Our field corn was estimated at $300,000, as the price was very high, as was that of almost all grains. This gave the farmer who raised field corn very good pay for his work.

Wheat. The wheat crop was estimated at $250,000. Wheat is a crop that can be raised in many parts of our State with the best of results, and as good quality can be grown in Maine as in any part of this country, especially winter wheat. I hope the farmers will raise more wheat, as they did in years past, as it is a very important crop. We should not depend so much on the West to raise our wheat, as we can raise it to good advantage in this State.

Barley. Our barley crop amounted to about $100,000. This is another crop that can be grown in many parts of this State to good advantage.

Miscellaneous Crops. Many of our farmers are growing large amounts of cabbage and squash, which bring a good price in the Boston markets; and we are able to raise various other crops and vegetables to good advantage.

THE MAINE ORCHARDS.

Our orcharding is on the increase, as hundreds of acres of young orchards have been set out during the past few years, and many of our old orchards are being cared for and put into a productive condition. If the orchardists of our State will trim and prune their trees and spray at the proper time, thereby taking care of the insect pests and diseases, it will be of great assistance in producing better crops. Our State Horticulturist and his Assistant have been assisting the growers by demonstrations that have been carried out in different parts of the State, which will be of great benefit to the growers of fruit in produc-

ing a better quality for the market. The orchardist who takes care of his orchard and gets it in a good thrifty condition, will find that it will pay him in a very short time, as his fruit will be in so much better shape for the market and he will produce larger crops. We have the best soil for growing fruit that can be found in any part of the world, as our soil is a granite soil, well adapted for fruit growing, and we hope to see our orchardists develop this industry until Maine becomes one of the leading fruit states of this country.

INSECT PESTS.

The Gypsy moth has been kept in check and has not spread to any amount. There have been a large number of egg clusters destroyed by the men in the work, and a thorough scouting has been done in the section of the State that is infested with this pest. We have had splendid assistance from Mr. D. M. Rogers, who is the United States Inspector for the New England States.

The brown-tail moth during the past season has been very troublesome. Being very dry and hot, it was very favorable for the moths to increase and there were more brown-tail nests on the trees than ever before. I hope the officers of the cities and towns will attend to their duty in having these nests removed from the trees and bushes in their respective places, where the nests are present, and thereby prevent the further spreading of this pest over the State; especially on the highway. Where they are allowed to remain on the trees until they come out in the form of moths, they are distributed from one part of the State to another by automobiles, electric cars and railroad trains which attract them by their powerful lights, when they are flying. This is one of the most dangerous ways of spreading the scourge of the brown-tail throughout the State.

THE DAIRY WORK.

We have been assisting the dairymen in the line of cow testing work, but on account of the high price of grain, the value of hay, and the shortage of good help, it has been a poor year for the dairymen. Most of the dairy products are handled by the creameries, and they handle the product largely in the form of

sweet cream. A very small percentage is made into butter and cheese. We have a large sweet cream trade in Massachusetts, and even our whole milk is sent to Massachusetts to some extent. The dairy product for the year amounted to about $10,880,000, though, as in the case of many of the products of the farm, the producer did not get the price he should. We must get more for our dairy products, under the conditions, or the dairyman cannot continue the business; as it is acknowledged by the best of authority that clean milk at ten cents per quart is the cheapest food that can be obtained, taking into account the food value as compared with other articles of food at the present prices.

SEED IMPROVEMENT.

The seed work was well taken care of by the Department. Valuable assistance was rendered by the department of plant and animal breeding of the Experiment Station at Orono, and members of the Seed Improvement Association. We find that many of our farmers are not paying the attention that they should to the selection of the seed that they plant. Careful selection of seed would mean thousands of dollars to the farmers of this State annually. We hope to improve the conditions, so that the farmer can raise larger crops by the selection of good seed.

POULTRY.

Our poultry industry is largely on the increase. For the past year it amounted to $4,000,000. This is an industry that is not receiving as much aid from the State as it should. Our breeders of poultry are well up in the front with the breeders in different parts of the country, on pure bred stock as well as birds that are bred for business, and I think we should have a man to assist the poultry keepers to develop this industry, as I think it would be of great advantage to the poultrymen of the State.

THE SHEEP INDUSTRY.

I am very sorry to learn, from the reports of the State Board of Assessors, that the number of sheep kept in this State has decreased so much, as the number given us by the Assessors

in 1900 was 248,140, total valuation, $639,157, or an average value of $2.57 per head, and the number given for 1910 was 125,439, total valuation, $379,606, or an average of $3.03; making a decrease of 122,701 sheep, a dropping off of nearly one-half of the number of sheep kept in our State in ten years. Perhaps this is due to the fact that our sheep men are not keeping so many sheep as they did in years past when they were kept more for the wool. Now there are more sheep killed for mutton and the lambs are put on the market for food and bring a good price; and it is a temptation for the owners of the lambs to sell them at such high prices as the markets will give. But, on the other hand, if they would raise more of the lambs, how many more sheep they would have to breed from in the future. If every sheep breeder in this State would say that next year he would raise one-half his ewe lambs, what a wonderful increase there would be in the sheep industry of our State.

We must keep more sheep to feed the hungry and clothe the naked of this great nation, and under the conditions which exist at present in regard to the help question, it seems to me that sheep can be kept with a good profit. I hope that in the future the number of sheep kept in this State will be on the increase, as we have the fences for the sheep and the laws for the dog.

SWINE KEEPING.

There is no reason why the farmers of this State cannot raise swine with a good profit. At the present price of pork and the high prices that are paid for young pigs, there is no animal that can be grown on the farm that will turn the owner a handsomer profit than the hog, and better utilize the waste products of the farm, if he is properly fed and given a fair chance.

Hogs can be kept to good advantage in orchards if they are not kept in too small a range, and they assist in consuming the fruit that drops from the trees and loosening up the earth around the roots of the trees, and are of more or less assistance in fertilizing the orchard. Also, we have many pastures in the State where hogs can be kept to good advantage, especially where there are stone walls for fences. I have seen hogs in

Sheep Owned by W. C. Briggs, Auburn, Maine.

pastures that were covered with sweet fern, which saps the land very much in many parts of our State, and we find that the hogs will get to the roots of the sweet fern and follow them from one bush to another, as the bushes all seem to be connected, and in this way destroy the growth of this plant which is such a pest in many of our pastures.

It was a surprise to me to find so many owners of hogs in different parts of the State that were not acquainted with the symptoms of hog cholera and did not know there was any preventive. They would let their hogs die and get discouraged and give up raising swine.

No one can afford to keep hogs to any extent without having a large hypodermic syringe and a supply of serum on hand. Many swine raisers keep a supply on hand and at certain times of the year, when the cholera is likely to break out, or when it is known to be in that vicinity, they find it a good plan to inoculate the hogs with serum. That ensures the owner that his hogs will not have the cholera, and it is a simple operation to inoculate hogs that are exposed to or have symptoms of hog cholera.

CONTAGIOUS DISEASES OF ANIMALS.

The Cattle Commission was added to this Department May 1st, 1911, by an act of the legislature and the appointment of a Live Stock Sanitary Commissioner by the Governor. It was found very necessary to put this work on a business basis, as it was not handled for the benefit of the people of the State. With three men as commissioners, in different parts of the State, it was a difficult task to conduct such important work and do it for the benefit of the owners of animals and the State; but the new laws will be of great benefit to all concerned, especially to the State financially, as it has been long recognized that such a Commission should have an office at the State Capitol, and conduct this work, as it should be conducted, from one center in the State.

FARMERS' INSTITUTES.

We have held many Institutes in different parts of the State, and have tried to get men to conduct these institutes that will get to the practical part of our farming operations; and the farmers have taken very kindly to it, as it is more instructive to present the practical part, with the scientific part as far as it can be practically used. We have started a movement to have the farmers co-operate in selling their farm crops and purchasing their supplies, and we hope to eliminate some of the middlemen between the producer and the consumer, especially the dishonest ones.

Institutes have been held in 1911 at the following places: Kennebunkport, Perry, Alexander, Calais, Cumberland Center, Brunswick, Richmond Corner, Durham, Limestone, East Auburn, Greene, Fort Fairfield, Belgrade, Oakland, Westfield, Brownville, Chelsea, Abbot, Cooper's Mills, Bangor, Wiscasset, Corinna, East Warren, Camden, St. Albans, Cambridge, Hope, Farmington, Strong, South Montville, Morrill, Weld, Burnham, Rumford Center, East Orland, Sumner, Bluehill, South Paris, Cornish and Ellsworth.

The speakers from out of the State were W. F. McSparran, Furniss, Pa.; C. E. Embree, Sales Manager of the Long Island Potato Exchange, Riverhead; N Y.; Prof. J. W. Sanborn, Gilmanton, N. H.; Prof. C. S. Phelps, Salisbury, Conn., and Prof. T. R. Arkell, Durham, N. H.

AGRICULTURAL SOCIETIES.

The fairs held throughout the State were very successful this year. The weather was very favorable and there was a large exhibit of cattle, horses, sheep and swine, and many exhibits of milk, cream, butter and cheese; and the hall exhibits of fruit and vegetables were unusually good. Some of the finest exhibits were made by the granges in different parts of the State. I am very much indebted to the officers of the different fairs for the way the fairs were conducted in relation to gambling, immoral shows, and the sale of intoxicating liquors, and the general management. Everything was carried on very harmoniously.

The following figures show the business of these societies in 1911:

Number of horses and colts exhibited	2,058
Number of neat cattle exhibited	7,907
Number of sheep exhibited	2,813
Number of swine exhibited	673
Number of poultry (coops) exhibited	8,968
Amount of premiums and gratuities awarded	$46,501 40

PUBLICATIONS.

The regular Quarterly Bulletins of the Department for the past year have treated upon the following subjects: Composition of Feeds; Raising the Calf; Contagious Abortion; Laws of Maine relating to Agriculture and Animal Industry; Insect Pests and Diseases of the Apple; The Sheep Industry. The requests for these Bulletins have been numerous and many names have been added to our mailing list during the year.

The Quarterly Bulletins on the Investigation of Dairy Products have contained, in addition to the analyses of samples of milk, cream and butter and the results of prosecutions for violations of the law, articles upon the following subjects: Clean Milk Cans; The Covered Milk Pail; The Retailer and Dirty Milk; Testing Dairy Cows, and Clean Milk.

ACKNOWLEDGMENTS.

In consideration of the splendid assistance that has been rendered me as Commissioner of Agriculture, I wish to acknowledge my appreciation as follows:

To the Governor and Council, for their approval and support in so many different branches of my work that are for the benefit of those interested in agriculture as well as the State and her people.

To the Attorney General, Hon. W. R. Pattangall, who has rendered me such valuable assistance in the interpretation and the enforcement of the laws of this State which must be carried out in the different branches of this Department.

To the State Auditor, Hon. Lamont A. Stevens, to whom all accounts must be rendered for approval before going to the Governor and Council for the drawing of warrants. All business has been done in harmony.

To the United States Department of Agriculture at Washington, especially the Bureau of Animal Industry and the United

States Inspectors in different parts of this State, who have assisted this Department in the work relating to contagious and infectious diseases among animals; and to the Dairy Division of the United States Department for the assistance they have given me.

To Dr. Robert J. Aley, president of the University of Maine, for the assistance he has rendered us personally and through his professors in the different branches of agriculture, and the annual report of his College.

To Dr. Chas. D. Woods, Director of our Experiment Station, for the assistance rendered by him and his professors at the Station, especially in the line of entomological work, and for the annual report of the work of his Station and that of Highmoor Farm.

To Prof. Henry D. Evans, in charge of our State Laboratory of Hygiene, for the assistance he has given our State chemist in prosecutions for violations of the dairy laws.

To the Pomona and subordinate granges in different parts of the State, for their able assistance in conducting our Farmers' Institutes, by furnishing halls and entertaining the speakers that were sent from this Department.

To the men in this Department, for the able support they have given me in the different branches of the work; also, to those who have assisted us in the Institute work conducted by the Department the past year, and to my chief clerk and her assistants, who are always ready and willing to assist me.

WEIGHTS AND MEASURES.

The work of adjusting the weights and measures of the State was added to this Department by an act of the legislature at its last session, which went into effect the first of July, 1911, making the Commissioner of Agriculture State Sealer of weights and measures. The condition of the weights and measures all over the State is very poor, as our State standards have not been compared with the United States standards for more than forty years, and no sealer in the State could prosecute any party for using false weights and measures. In December the Governor and Council passed an order to purchase a set of State standards, at a

price not to exceed $2,000, and a suitable set of standards has been ordered. On the receipt of same the work of comparing the weights and measures of the cities and towns will be taken up. It is hoped that we can improve the conditions so that the purchaser may know that he is getting just weights and measures. This will be of great assistance to the producer and the consumer, as it is generally known that our weights and measures are in very bad shape all over the State.

A very interesting exhibit of weights and measures was made at the State Dairy Conference held in Portland in December, and the following address by Mr. J. C. Connors of Troy, N. Y., will give an idea of the conditions which exist and the need of improvement.

ADDRESS AT STATE DAIRY CONFERENCE, PORTLAND, DEC. 28, 1911.

By J. C. Connors, Troy, N. Y.

Ladies and Gentlemen:—

I would like to give you a little talk today on the subject of Short Measures and Light Weights. In this connection, I am reminded of a little occurrence that happened while I was sealer of Cambridge, Mass. I went into a store and a man had a butcher scale and an electric light hanging on the hook. I asked why he had the electric light, which weighed 1-4 pound, hanging there. He said the scale was in a dark place. I told him he had a little more light than was necessary, as in every transaction he was cheating the customer 1-4 of a pound. He was fined $25 and concluded to have a little less light on his scales.

The subject of weights and measures and the proper regulations in relation to weighing and measuring instruments is being largely agitated, and legislation on this subject is being enacted all over the country at the present time. Thirty-four states in the Union have legislation at the present time and departments of weights and measures, also sealers in each city and county, and they are doing excellent work. They are doing excellent

work in this line out in the West and the Middle West and the penalties imposed in that section for giving short weight or measure, are very severe.

To go back to the earliest times, when the constitution of the United States was adopted an article was put into it giving Congress the power to regulate weights and measures. Congress so far has not taken any action in the matter. It has left the subject largely to the individual states, and most of the states have legislation and regulations which apply only to their own state. This, of course, makes a great deal of confusion. While there might be a regulation in Maine, we will say, on the subject of apple barrels, denoting the size and the dimensions, in New York State there is another regulation. There will be a measure introduced into Congress at the next session which will make a uniform and standard size for all barrels and boxes throughout the country, which, if enacted, will prevent this confusion. A Maine apple barrel will be just the same as a California apple barrel. This is a subject that we want threshed out in Congress. In St. Louis on January 4th there is a meeting of the Western Produce Association in which they will take up this subject and write up a measure to be introduced in Congress. In 1836 the United States supplied to each state in the Union a set of standard weights and measures which were adopted by the several states. Maine then adopted the standard weights and measures that were presented to them and until now they were the only standards existing in the State. Under authority given the Commissioner of Agriculture by an act of the last legislature, he is taking measures to procure new standards. These old standards have rusted and worn so badly that they were practically useless. Mr. Buckley has started now to procure new standards and it will be but a short time before there will be a perfect system of weights and measures throughout this State. Maine is one of the last states here in New England to take up the matter. The State of Vermont took it up in 1910 and they have now a force of men travelling throughout the State regulating the weights and measures and the methods of weighing and measuring. Connecticut has a system, and Massachusetts has had a system for the last 50 years. The laws of Massachusetts have been copied pretty much throughout Maine, and they are as good laws as there are in the country.

As far as the laws go, we ought to have more here in Maine. At present there is no law on the statute books in Maine which prevents the giving of short weight. There are laws in regard to the use of false scales but if a man gets short weight now the only charge he can make against the dealer is for larceny. You can see by the amount of apparatus that has been collected here in the city of Portland that there is some necessity for these laws. There are quite a number of people, food producers and farmers, that are looking towards national legislation on this matter. The food producers are going to Congress either this next session or the session after that, to ask for uniform legislation in regard to packages. There are eight states now in the Union that require the placing of weight, measure and count on all packages of food stuffs. There is a good deal of necessity for that legislation. Take for instance, cereals. At one time we had a pretty fair package of these. I will cite one case in which one of the large cereal manufacturers formerly put out a package containing two pounds of rolled oats. At different times that package has been cut down, until now it holds only 1 1-4 pounds. It sells for the same price as formerly, but the weight has been taken off. The present trend is to make the packages as small as possible and eliminate the weighing when it can be done. In this way we have bacon put up in glass jars, at a price of 58 cents a pound. We have puffed rice, at 33 cents a pound in packages, and dried beef sold for 18 cents a pound. We have crackers put up in packages, common soda crackers, at 15 cents a pound, and in bulk practically the same thing could be bought for 7 or 8 cents. It shows that the manufacturers are putting these articles up in package form for the purpose of deceiving the public. It is only a short time ago that they started putting vinegar and molasses into bottles. There was a time when if you wanted a quart of vinegar or molasses the dealer drew it out in a quart measure, but now he generally takes a bottle down from the shelf, and there are usually six to a gallon. He hands one of these bottles to you for a quart. That is the way the food stuffs are going now. To prevent that, eight states have passed laws requiring that the amount contained in the container shall be placed on the outside. Most of these states have different laws on the matter and a state of general confusion prevails.

For instance, in Florida, they have to mark on the weight and measure, in No. Dakota, the weight, measure and numerical count. So, for relief they are going to Congress to ask that uniform laws be passed. The same thing applies to the manufacturers of weighing and measuring instruments. Different states have passed specifications in regard to how they must be made. A man can make a scale that might pass in Maine and when he sends it over to New York it would be thrown out.

Another state of confusion in the country arises from the different weights per bushel of commodities. We find that in New York State we have to put 57 pounds of onions into a bushel, and right across in Massachusetts, 52 pounds to a bushel. In Maine the law requires 44 pounds of apples to a bushel and when you send them down to Massachusetts you are compelled to put in 48 pounds. That state of confusion maintains all through the country, and so there will be a measure introduced in Congress to make a uniform weight for a bushel of the various commodities.

When we get three or four of those regulations throughout the country there is no question but that the weights and measures will be very well regulated; and even now in some states, we regulate the weights and measures and see that nothing but good scales and measures are put out. But we still have the personal dishonesty. We find that a great many people to get a little more will try various methods. For instance, we have a scale which is apparently all right; it looks good to almost anybody, but if a man touches it with his finger, it becomes incorrect. That is what we call personal dishonesty. And this is what the sealer of weights and measures has to look after. It is his duty to oversee the weighing and measuring and stop the dishonest methods. Then the sealer of weights and measures should be around all the time to see that the weights and measures are properly used. For instance, when you buy a pound of butter and the man puts it in a dish weighing nearly an ounce and puts it on the scale, you pay 38 cents a pound for the dish. Sometimes the dish is soaked in water and you also pay 38 cents a pound for the added water. A light pulp dish has been manufactured, and the dealers admit that it is a good dish, sanitary and convenient, but they say it is not heavy

enough, a man cannot get enough out of it, so the manufacturers cannot sell the dishes.

Then we have a method like this,—a man uses paper bags, 12 weighing a pound. When the dealer sells articles in those bags, each bag weighing 1 1-3 ounces, he gives you short weight. For instance, if he uses those bags for tea, he gets about 60 cents a pound for his bags.

I have seen circulars issued by some of the dealers in paper, one dealer in particular in New Jersey, in which attention was called to the fact that the paper and bags were of the very heaviest made. The circular read "It is a sanitary provision to tear off a piece of paper, and put it on the scale and then put the meat on it", and this man was advertising particularly heavy paper for that purpose, and sending out circulars all through the trade. We called public attention to this dishonesty and when he found what a furor it was creating, he called his circulars in. We have another method in boxes like those used for ice cream. Here are two boxes one containing a full quart, the other 5 ounces short. There is another little trick in berry boxes. They have a box that looks all right and you might think it was a very good box but a huckster comes along with the box about 3-4 full, and he squeezes in the side and the berries come right up around the top.

The junk dealer comes along with a scale like this one which you see here. You save up all your rags and rubber and iron in the winter and then sell them to him. He hangs the bag on that scale, and the scale is apparently all right, but he keeps his finger on the top of it and when he gets ready to weigh he pushes the face down and cheats you about five pounds. The face slides up and down.

Another case of personal error happened right here yesterday. Mr. Buckley and I went out to get two bushels of potatoes. We went into a store and said we would like to have two bushels of good potatoes. The man showed us a bag that apparently had two bushels of potatoes in it. The laws of the State of Maine require that a bushel of potatoes should contain 60 pounds. I asked him if there were 120 pounds in the bag, and he assured me that there were. We paid him $2.10 for the potatoes, $1.05 a bushel. We brought them up here and weighed them and they were 13 pounds short, which makes a

difference of ten per cent. So you can see what necessity there is for the sealer of weights and measures to go around and look after these things, and to see that the people in the city of Portland and in the State of Maine get what belongs to them. The sealer of weights and measures is an official who is to see that everybody gets 16 ounces for a pound and 32 quarts for a bushel, and if the people of the State of Maine do not get this, they should let the sealer know, or let Mr. Buckley know. I know that Mr. Nugent here in Portland, and Mr. Buckley, if they receive any complaints of short weight or short measure, will see that the offender is prosecuted and that you get your rights. They are paid a salary to do this. The State of New Jersey has just passed a law which provides that any person selling an instrument for weighing or measuring which is of a type calculated to perpetrate fraud shall be fined. That is, if a person goes down there to sell a scale or weight or measure which is not of proper construction or inaccurate, he will suffer a penalty of $50. It is easy enough to eliminate these, but where the most work comes in is, after the instruments are all right, to prevent perpetration of fraud through the man trying to cheat the consumer. This fraud is not alone practiced on the man who goes in to buy a pound or a quart. The big companies practice it on the retailer and on the wholesaler. For instance, take the lard packages,—lard done up in tin pails. It was the custom at one time to put three pounds and five pounds and ten pounds in pails; but within the last ten years they have got into the habit of weighing the pail in. If you should go into a store to buy five pounds you would get four pounds and three ounces of lard and the rest pail. When you buy a box of pork loins, you will get three ounces of paper wrapped around each loin; and the same way with hams. The ham is done up finely, it is sanitary and everything of that sort. It has fancy paper and burlap around it and then it is tied up with red ribbon. It is not weighed until all this is on it, and you pay for the wrappers at ham prices. When the butcher goes in to buy a lamb he pays for the backing sticks and the caul fat that are placed over the lamb, at lamb prices. So he passes it along to the consumer and the consumer gets the worst end of it, as he always does. The large companies always protect themselves. When the dealers buy lard, the packers will

bill the pails as 3s, 5s, or 10s, and if there is any complaint they say, "That is not a five pound pail, that is not five pounds of lard, that is a 'five'." The butcher or grocer does not know that,—he sells it for five pounds.

Then we have the practice of using the liquid measure for the dry. If you buy beans or small onions or cranberries in some localities, the man will take a liquid measure and fill it up. There is not a person in a hundred who knows the difference outside of people who are interested in weights and measures. They say a quart is a quart. As a matter of fact, there are two kinds of quarts and the liquid quart is 14 per cent short of the dry quart. If a man bought a bushel of cranberries and sold them out by liquid measure, he could sell them at the same price per quart and make 52 cents on a bushel, at 10 cents per quart, because he could get over 37 quarts out of a bushel by selling by liquid measure. That is one of the commonest forms of fraud. Unfortunately we have both dry and liquid measure and there is always a temptation to use the smaller measure for dry commodities. All fruits, berries and dry vegetables should be sold by dry measure. Cranberries, peanuts, etc. are a good many times sold by liquid measure instead of by dry measure.

We have a great many milk bottles in the State of Maine. When a person goes to buy milk bottles from the manufacturer, the manufacturer always asks him what kind of a milk bottle he wants, a full quart or a 30 ounce quart, or a 28 ounce quart. The sealer of weights and measures has the job of trying to check up those milk bottles. I do not doubt that in the city of Portland alone four or five hundred thousand are used every year, and a good part of the time of the sealer of weights and measures is consumed by working in the office and testing milk bottles. What is being done in Massachusetts and other states is that the manufacturers are bonded to the State to make nothing but a standard bottle. In Massachusetts, for instance, the manufacturer blows into the jar the words "Massachusetts, sealed," and also a check letter which identifies him as the maker of that jar. Then if any of those jars are found short, there is a penalty of fifty dollars against him. So you see that puts it right back to the manufacturer. Unfortunately, here in Maine the loss falls directly on to the milk dealer or the farmer

who uses the jars. If the jars are short, they are condemned by the sealer of weights and measures and the loss is sustained by the milk dealer. I hope to see the day when Maine will have a law like Massachusetts which will place the loss on the manufacturer, relieving the sealer of weights and measures of the necessity of measuring each individual jar and if it is wrong being compelled to condemn it so that the dealer cannot use it any more. This should be done right at the factory. It is the same way with all other bottles in the trade. If you want to buy a quart flask, either for wine, or for any purpose, and you go to the manufacturer he will ask you what kind of a quart, 4, 5, 6, or 7. A 7 is seven to a gallon, and a 4 is four to a gallon. You can get whatever you want and he will put on the outside "full quart," if you want him to. That does not guarantee the measure at all. When we get a regulation throughout the United States that the weight or measure, or the numerical count, must be put on the outside of these packages and bottles, or containers of any kind, that will guarantee that the container contains just what is marked on it. As a matter of fact it will take a national regulation to do it and then it will be under United States control.

There is another big question that I think has held Maine back as regards the weights and measures laws, and that is the question of fees. Under the laws of the State of Maine each sealer of weights and measures is compelled to go around so often and when he makes an inspection of weighing and other instruments to collect certain fees. That to my mind is very wrong. There are only a few places in the country where a dealer is compelled to pay for an inspection of his weights and measures. It is a protection of the public and the public should pay for that protection in the annual taxes. In the city of Portland I understand the amount of fees collected is about $450 annually. That would not make more than a cent's difference in the tax rate but it throws almost the whole cost of this inspection right on the dealer; and it seems to me that the dealer should have the same protection and the public should have the same protection, in weights and measures, as they have against fire and burglars. It should fall under the same head. Of course the dealer is protected against unfair competition, in this way: While one dealer is honest, doing a good business

and using his customers fairly, he finds that some time or other a man opens up a store,—it may be a syndicate store or a cut rate store—and this man is cutting prices, selling goods lower than he can sell them. He sends somebody down there to find out what he is doing and he finds out that the man is giving short weight. Apparently that man is prospering and is getting all the trade away from the honest grocer. What the sealer of weights and measures wants to do is to go down and make the other fellow give full weight and measure and then he will find that the man who wants to be honest will do the right thing. The only way to meet this thing is to equip every house with a set of scales and a set of measures, just a cheap scale and a cheap set of measures,—not over two—and then when anything is bought for the house, simply weigh it on the scale or empty it into the measure and you will find out right away whether you are getting full weight and measure or not. When you do this and find you have not received the full quantity, don't have a controversy with the man of whom you bought it. He will act injured and have some excuse. Simply call up the sealer of weights and measures and tell him that you have got short weight or short measure. If he goes down to the store the dealer will not have any controversy with him, he will try to square it in some way. That is what every person should do,—call up the sealer and tell him the circumstances and he will see that justice is done. The sealers of weights and measures are being paid for their services, and they are willing to earn their salaries if the public will only co-operate. But it is impossible for the sealers of weights and measures to witness every transaction that is going on and they only know these things, or the great bulk of them, through complaints from the public. If a citizen here should make a complaint to Mr. Nugent, that would be the end of it as far as he was concerned. Mr. Nugent very probably would not act on that complaint. He would send his own man and get his own evidence and then prosecute on what evidence he could secure. It would be bad economy for the purchaser to give half a day to prosecute a man for a few cent's short weight, but unless somebody prosecutes him he is going to give that to everybody and it amounts to a good deal. If a dealer gives a few ounces short weight, it amounts to but little in any one case, but multiply that by three or four hundred

transactions in a day and you will find that it makes a good sum of money in a week.

Another thing that the sealer of weights and measures does is to check up the coal in the course of transit to the consumer. I have been very much surprised at the amount of short weight given in coal. In one city recently, there was some coal checked up, billed as a ton, which weighed 1350 pounds. That man probably wanted to make a fortune in a few days. Ordinarily if a man wants to give short weight he will take out two or three hundred pounds. We had a case in New York City where a man was giving short weight. We checked up that wagon two or three times, weighed it before and after delivery and it was all right. But talking with the driver at one time, he gave us a tip as to how it was done. Under the seat was a box and in that box was 300 lbs. of coal. When he was stopped by the sealer he would open that box and deliver the ton; but if he was not stopped that 300 lbs. would stay in the box. After we found this out it was a very easy matter to catch him. We have found that there has been a great deal of short weight given in coal, especially in the cities where coal is sold in small quantities. It is not the value of the coal so much as the amount of personal loss or personal inconvenience, in a good many cases, that is brought on to the consumer through the absence of a few pounds of coal. To illustrate that I will cite a little instance: I was out once on a Saturday night looking after some of the dealers in coal. One man brought up a bag of coal supposed to contain 100 pounds to the second floor of a tenement house and the woman showed me the coal. I tested it and it weighed 80 pounds. She said she was a widow with three children and she worked hard, scrubbing floors. She bought a bag of coal every Saturday, and since dealing with this man she found that the coal would not last over Friday night. She could not buy any more until Saturday afternoon and those children had to stay in bed all day Saturday in the winter, to keep warm, simply because that man took 20 pounds of coal from the sack. That is one of the cases where the shortage is not measured by the money loss but by the amount of inconvenience and suffering entailed. We have found a number of those cases, which make us feel as though we wanted to inflict some severe punishment on the man, but unfortunately the law does not allow

it. He is generally fined five or ten dollars and then he goes out and does the same thing again. In New York City we found people who would cheat every opportunity they would get, and when they were caught they would go into court and pay their fine, which was five or ten dollars, and then they would go out and take the chance of being caught again. They did not care much about their reputation; it did not amount to anything. But one thing that keeps business men, in good respectable communities, from giving short weight or measure when they have a leaning that way, is the fact that in most cases, there is a good deal of publicity attached to it. If a man gives short weight or measure he does not want to get caught because the public will usually know of it and it will spoil his reputation. When we find a man cheating and publish his name it hurts him a good deal.

Some of the condemned scales and measuring utensils that Mr. Nugent has collected in the city of Portland are shown here. There are many ways of fixing the scales so that they will weigh more than they should. People as a general rule do not look at the scales, and there is a great opportunity for giving short weight.

In New York City, certain dealers have a habit of asking, when a man comes in for a job, if he can make his salary on the block. Making your salary on the block is done in this way: When you weigh out anything, say a six pound roast of beef, you put it on the scales and call it seven pounds; put it down on the slip of paper as seven pounds. That is passed along to the desk, and billed at seven pounds. There is a clerk who checks the weight and when that roast comes down they credit that man with a pound of beef. Saturday night this will have to amount up to $15, if that is his salary, or he is discharged. You would be surprised to see how common that practice is. Some dealers will not hire a man unless he can make his salary on the block, as they call it. Many of them can do this, as they are used to reading the scale and can read it fast. Sometimes they bill up 57 cents worth of meat and do not put on the number of pounds. But we are trying to get a law passed which will compel them to put the number of pounds and the price per pound on the bills, which will simplify matters a good deal.

When a peddler comes along, do not let him bring you potatoes or other vegetables in a peach basket. They have a nice little trick of filling up a peach basket when they sell a peck of potatoes. Peach baskets are generally made in New Jersey and they usually hold 6, 10, 12 and 14 quarts. A good many times if you ask a peddler for a peck of potatoes he will fill up a six quart peach basket, or if you ask for two pecks, a 12 quart basket. You often see these peddlers going around, three men with a horse and wagon, and they cannot make a day's pay unless they give short weight or measure. The only way is to have a peck measure sealed by the sealer of weights and measures in the house, and then when a man comes in with a peck of potatoes you can ask him to put them in the measure. The chances are that he will avoid selling to you afterward, but at any rate, you are sure of getting full measure. There are many ways in which they try to fix up the measures,—sometimes they will take out the bottom and bring it up a little and nail it over again, sometimes they will take the bottom out and cut the measure off and then put the bottom in again, and again they will have a row of nails with a loose bottom. Some of the magazines last year illustrated quite a number of those things, and as far as I have seen the articles they are all descriptive of things that were found in some of the cities.

In conclusion let me say that I know Mr. Buckley, your Commissioner of Agriculture, realizes the importance of securing to the people of Maine their full quantity and that he will see that proper weight and measure will be given in all cases, which in my opinion will do a great deal to reduce the present high cost of living.

REPORT OF STATE DAIRY INSTRUCTOR.

To Hon. J. P. Buckley, Commissioner of Agriculture:

Having resigned from the position of State Dairy Instructor, I respectfully present my report to and including October 23d, 1911, the date when my official relations with the Department of Agriculture closed.

Since my acceptance of the position as State Dairy Instructor of the Dairy Division, Department of Agriculture, I have had charge of the dairy work that pertains to this office. After fulfilling same to the best of my ability, and unexpectedly having a call to leave the state, I regret very much to be obliged to make my report for such a short duration of time.

During the past season I have put in considerable time with the dairymen of the State, getting with them upon their farms and in their dairies, so as to study the conditions as they existed. During the first half of the summer the majority of dairymen that were shipping their product to the creameries were very much discouraged relative to the price paid for their product, as the great reduction in prices paid by the creameries to the producers had caused much unrest.

Still, as the season advanced and the prices began to ascend to where they were during the year 1910, the dairy interests took a better turn. In my work with the dairymen I have gained much information that has aided me greatly toward solving the problems that confront them. I have also had a chance to inspect the dairies and creameries over the section of the State thus visited, and I shall endeavor to make my report under headings appertaining to same.

INSPECTION OF CREAMERIES.

During my work with the Department of Agriculture I have visited quite a number of creameries and found them in the

majority of cases practicing sanitary methods, while some, for various reasons, I again visited.

These creameries report that the product as it comes from the farms is in very good condition, being of a little poorer quality during the hottest part of the season. In going about and meeting the patrons of the creameries, I found that as a rule they were quite well satisfied with the usage they received from the managers of the creameries relative to the Babcock test.

DAIRY PRODUCTS COMING UNDER THE JURISDICTION OF THE MAINE FOOD LAW.

Dr. Chas. D. Woods, Director of the Maine Experiment Station, Orono, acting in accordance with Public Laws, 1911, Chapter 119, appointed me, August 11th, 1911, as one of his deputies to inspect creameries and dairies in the State of Maine, A portion of this chapter reads as follows:

"The director of the Maine Agricultural Experiment Station shall annually analyze, or cause to be analyzed, samples of articles of agricultural seed, commercial feeding stuff, commercial fertilizer, drug, food, fungicide and insecticide, at such time and to such extent as said director may determine. And said director, in person or by deputy, shall have free access, ingress and egress at all reasonable hours to any place or any building wherein articles of agricultural seed, commercial feeding stuff, commercial fertilizer, drug, food, fungicide, insecticide are manufactured, stored, transported, sold, offered or exposed for sale. He shall also have power, in person or by deputy to open any case, package, or other container, and may, upon tendering the market price, take samples for analysis. The results of all analyses of articles of agricultural seed, commercial feeding stuff, commercial fertilizer, drug, food, fungicide and insecticide made by said director shall be published by him in the bulletins or reports of the Experiment Station, together with the names of the persons from whom the samples were obtained, the names of the manufacturers thereof, and such additional information as to him may seem advisable."

"In case of food an article shall be deemed to be adulterated:

First. If any substance has been mixed and packed with it so as to reduce or lower or injuriously affect its quality or strength.

Second. If any substance has been substituted wholly or in part for the article.

Third. If any valuable constituents of the article have been wholly or in part abstracted.

Fourth. If it be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed.

Fifth. If it contain any poisonous or other added deleterious ingredient which may render such article injurious to health.

Sixth. If it 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 manufacured or not, or if it is the product of a diseased animal, or one that has died otherwise than by slaughter.

Seventh. If in the manufacture, sale, distribution, 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.

Eighth. If it does not conform to the standards of strength, quality, and purity, now or hereafter to be established by statute or fixed by the director of the Maine Agricultural Experiment Station: Provided, that a food shall not be deemed to be adulterated under this provision if the standard of strength, quality or purity be plainly stated, so as to be understood by the non-professional person, upon the container thereof, although the standard may differ from that established by statute or fixed by said director.

Ninth. If its strength or quality or purity fall below the professed standard or quality under which it is sold."

This in my mind has proven very beneficial for the managers of the creameries. As the inspection was made out on blanks furnished by the Experiment Station, the same were returned to the Director, who would write a very pleasing letter to the different creameries where inspection had been made, stating wherein they were delinquent in their methods, and, abiding by his courtesies, they have been able to handle their products in a much more sanitary manner.

DAIRIES VISITED.

During the past nine months I have visited two hundred thirty-eight different farms and dairies, meeting the men in their general routine of every day work and having a chance to study their conditions. This gave me a great opportunity to offer helpful suggestions.

During the month of March, the Board of Health, City of Portland, called upon the Department of Agriculture for assistance in improving the conditions from which their supply of milk came. I started upon a tour of inspection and at each and every dairy visited gave helpful suggestions as to cleaning up and renovating their dairy equipment and how to put in practice better methods. After a lapse of about six weeks a second inspection was made and more

help given then. Again, in due time, a third visit was made and the sanitary score card, adopted by the Dairy Division, Department of Agriculture, was used on all those dairies and in every case where the suggestions were adopted the score was very good. In each and every case the dairymen had a score of their methods and equipment left with them, so they could see wherein they needed to improve.

DAIRY TESTING ASSOCIATIONS.

It has been my desire to continue this educational work so ably started by my predecessors, and advance some wherever I could. One new Dairy Testing Association has been formed. This was organized March 18th, 1911, with the following officers:

President, Arch D. Leavitt, Turner.
Secretary, Fred P. Ricker, Turner.
Tester, C. W. Rowe, Turner.

It commenced to do actual cow test work, May 15th, with two hundred eighty-two cows pledged.

Through the towns of Turner, Turner Center and Buckfield, where this association is located, there are a great many large dairies and the dairymen in general grasped this as the most economical way to study the production of the dairy cow.

Some work has been done, by means of correspondence, toward reviving the Dairy Testing Association located in Winthrop, Monmouth and Readfield, and in general the sentiment was very strong toward re-organization; still, for lack of time that work has not been completed.

In regard to the associations that were organized prior to my connection with the Department, I have attended the meetings whenever possible and have assisted along dairy lines, getting the dairymen interested in the workings of the association and the welfare of their herds, and persuading them to study the herd records.

At each dairy meeting that I attended during the first part of the year there seemed to be a great deal of sentiment toward having a "Register of Merit" formulated by the Dairy Division, the same to receive the approval of the different associations. Your Dairy Instructor, seeing that a Register of this kind

would aid the dairymen financially, set about to formulate same with the following result:

REGISTER OF MERIT FOR PURE BRED AND GRADE ANIMALS OWNED BY MEMBERS OF THE DIFFERENT DAIRY TESTING AND DAIRY IMPROVEMENT ASSOCIATIONS OF THE STATE OF MAINE.

PREAMBLE.

For the purpose of having a more thorough knowledge of the highest producing animals of the different associations, and advertising the results through the agricultural papers, thereby increasing the value of such animals financially, this Register of Merit has been adopted.

RULE 1. This Register of Merit shall consist of two divisions, one for pure bred animals with recordable pedigrees, the other for grades.

RULE 2. All tests shall be for a period of 365 consecutive days taken from the Dairy Associations' records.

RULE 3. *Classification of Animals.* Cows from two to three years old shall be known as two-year-olds. Cows from three to four years old shall be known as three-year-olds. Cows above four years old shall be known as full age cows.

RULE 4. *Eligibility of Bulls.* All bulls shall be pure bred and have recorded pedigrees. Each bull must be a good type of the breed it represents and must have two daughters in the Register of Merit from two different dams.

RULE 5. *Eligibility of Cows.* Pure Breds. Two-year-old form. All cows over two years and under three shall be obliged to produce 250 pounds of butter fat.

Three-year-old form. All cows over three years and under four shall be obliged to produce 300 pounds of butter fat.

Mature form. All cows over four years of age shall be obliged to produce 400 pounds of butter fat.

RULE 6. *Grades.* Two-year-old form. Cows over two and under three years shall be obliged to produce 225 pounds of butter fat.

Three-year-old form. Cows over three and under four shall be obliged to produce 275 pounds of butter fat.

Mature form. Cows over four years of age shall be obliged to produce 375 pounds of butter fat.

RULE 7. A record of the animals from each association that have qualified for the Register of Merit shall be duly filed by the Dairy Division and a copy of same shall be sent to the secretary of each association.

RULE 8. *Amendment.* These rules may be altered, amended, or added to, at a meeting called for the purpose and supported by a two-thirds vote of the members present, consisting of a representative from each association. These members shall consist of the president of each association or some one authorized to act for him.

The Register of Merit has received the approval of the dairy associations over the state.

Mr. B. F. Twitchell, Official Tester of Waterville Dairy Improvement Association, having a great desire to get together the Official Testers of all the associations twice each year to talk over and discuss the working of each association, a meeting was called by the Dairy Instructor at the Agricultural Rooms, State House, Augusta, June 10th, 1911, and there was formed the Maine Co-operative Association of Dairy Testers with the following officers elected:

President, B. F. Twitchell, Waterville.
Vice President, Paul J. Fuller, Dexter.
Secretary-Treasurer, Harry M. Look, E. Waterford.

This getting the testers together in June and again in October, when the dairymen are changing from winter to summer feed and again from summer to winter, gives these young men a chance to study conditions and impart to each other statistics gleaned from their associations.

A few days was spent in Aroostook County as there is a Jersey Breeders' Association located there. Your representative attended the June meeting and a great deal of interest was manifested toward a dairy testing association in that county and in a radius of about forty miles three hundred twenty-seven cows were pledged for an association.

There is material in different sections of the State for quite a number of dairy associations, but there are not the young men with the ability that is required of them to handle such work, at the wages that have been paid, to act in the capacity of Official Tester.

After studying the problems that are confronting the dairymen, viz., high cost of mill feeds and scarcity of competent hired help, I do not think that any dairyman can afford not to belong to a dairy testing association as I know of no other way for a dairyman to study the production of the dairy cow more economically than through the channels of such an association. To show the value of such associations I quote a few statements made at meetings by members of different associations.

"If I had known as much about feeding cows ten years ago as I have learned while a member of the association for the period of one year, I might have saved *Thousands of Dollars.*"

"By weeding out a few unprofitable cows and purchasing better ones, I have realized $900 more from practically the

same number of cows for the year 1910 over 1909. This is a result of being a member of a Dairy Test Association, and I have a more thorough knowledge of the feeding and care of cows."

"More interest was taken in the workings of the association at the end of nine months than there was at the time of organization."

"Members of our association are purchasing co-operatively every month a large carload—24 tons—of mixed grain at a saving of from 10 to 25 cents per hundred, compared with retail prices."

"The cow that I thought was my poorest turned out to be one of my best; all that I knew about her before becoming a member of the association was to guess."

Some members have made the remark that the returns from the creameries were nowhere near the same as those made by the testers in their work. So I inclose herewith a letter from one enterprising dairyman and it speaks volumes for accuracy in dairy test work.

LIVERMORE FALLS, ME., June 3, 1911.

Mr. H. C. Black, State Dairy Instructor, Augusta, Maine.

DEAR SIR:—Our tester, Mr. Markham, has completed the year's work at my place today and I am much pleased with the accuracy of the work. For the first ten months of the year, Turner Centre Creamery has paid me for 2001.8 pounds of butter fat. After deducting the last two months' production from the totals of the year's work I find I am accredited on my records for the first ten months of the year with 2083.3 pounds fat, a difference of 81.5 pounds fat, equal to 1630 pounds of 5 per cent milk used in the form of milk and cream in the home. As these ten months took us through berry and garden time I think this amount none too much. By this comparison I feel that I have an unquestionably reliable source of information of the production of each cow in my herd and I congratulate Mr. Markham and Mr. Stevens on the accuracy of their work. I would rather pay 50 per cent more for the work than be without the benefits of the association. I write this to you because I may not be able to attend the meeting Tuesday and I want you to know of my appreciation of the work.

Respectfully yours,

F. E. ADKINS,

Member of the Oxford Co. Dairy Testing Association.

The opportunity for the dairymen to get together and converse freely with one another by the organization of these test associations, also the chance that they have to purchase co-

operatively such a large amount of material to be used for the farm, is, in my mind, a stepping stone for some higher and wider system of co-operation.

CO-OPERATIVE BREEDERS' ASSOCIATIONS.

The members of the Co-operative Breeders' Associations have taken great pride in the results of the workings of those associations by attending the meetings in large numbers and taking part in general discussions of questions and subjects that pertain to their associations, whether it be Holstein, Jersey, Hereford, or some other breed.

August 22nd, 23rd and 24th the three local Holstein-Friesian Breeders' Associations co-operated in securing the world-known Advanced Register Holstein-Friesian breeder, Colonel R. C. Goodell of Antrim, New Hampshire, to address these three meetings, viz., Androscoggin County Holstein-Friesian Association at the home of Fred H. Chandler, New Gloucester, August 22nd, with an attendance of fifty-five; Oxford County Holstein-Friesian Breeders' Association at the farm of C. L. Case, Paris Hill, August 23rd, with an attendance of one hundred sixty-five, and the Sebasticook Valley Holstein-Friesian Breeders' Association at the home of I. R. Shorey, Corinna, with an attendance of sixty-five.

The stock owned in these associations is being improved, as the members are getting helpful ideas by having a chance to exchange courtesies at these meetings, which are proving very beneficial.

MEETINGS.

As a representative of this Department, I have attended fifty-six meetings of various descriptions, with an attendance of two thousand eight hundred forty-four, not counting in the attendance at the meetings during my trip through northern Maine on the so-called "Northern Maine Farming Special," where I performed my duties as Dairy Instructor, devoting the required time in speaking at the meetings in various places. As near as could be estimated there were between eight and ten thousand people who visited the train and attended the evening meetings held by the entire instructional force. Neither does this take

into consideration my attendance at the Eastern Maine Fair, Bangor, one day, and at the Central Maine Fair, Waterville, and Maine State Fair, Lewiston, the entire four days.

I also attended seven county fairs that receive stipend from the State and assisted in every way possible in the advancement of the Dairy Industry by scoring and judging dairy animals and dairy products as well as products from the farm, vineyard and orchard.

In my awarding of first, second and third prizes on dairy animals, I gave demonstrations as to why the blue ribbon cow, or heifer, was superior to the one that received the red ribbon, as to her excellency in the qualities required of such an animal to reach the standard of perfection for such a breed.

I received various calls to attend other fairs to act in the capacity of judge, but could not avail myself of the opportunity to attend.

In closing I wish to express my most sincere appreciation of the cordial assistance given me in the work by the members of the Department, the press and the people of this grand old State, all of whom, both officially and as private citizens have given their assistance to help this good work along.

I thank you for your ever cordial support and if any conditions ever arise whereby I, in any way, can be of service to Maine agriculture, you and all agriculturists may be assured of my hearty co-operation in all that pertains to the advancement of Maine's greatest industry.

Respectfully submitted,

H. C. BLACK, *State Dairy Instructor.*

REPORT OF STATE DAIRY INSPECTOR.

Hon. J. P. Buckley, Commissioner of Agriculture:

I herewith submit my report as Dairy Inspector from May 1st to Dec. 31, 1911.

Since assuming the duties of this office, special attention has been given to the milk supplies of the different cities and towns visited, especially in the warm summer months, when numerous complaints have been received from different sections. These complaints have always been followed up and the cause of the trouble remedied. Revisions in the dairy laws have placed the responsibility of adulterated or watered milk or cream on the person in whose possession it is found. Many dealers who buy their product have rebelled against this change, calling it an injustice to them, but the law protects the consumer and makes the dealer more careful as to whom he buys from. The law in relation to cleaning and sterilizing cans is a great help to the producer, but he should share the responsibility and be sure that the cans are clean.

This Department has signified its willingness to help a dealer who suspects that he is buying watered or otherwise impure milk, as is shown by the fact that four prosecutions have resulted from complaints received from milkmen themselves. During the entire year 792 samples of milk were taken, 46 of cream, 17 of skim-milk and 20 of butter; representing conditions in 15 cities and 25 towns, in every section of the State. Fifty-eight, or 7.3 per cent of the samples of milk contained water and there have been 28 prosecutions during the year for selling adulterated milk. More cases are pending, and two parties convicted have appealed to the Supreme Court. Of the samples of milk, 418, or 52.7 per cent, were found to contain visible sediment and were reported as dirty or slightly dirty. This large number of poor samples is very convincing that

there is something very radically wrong with the system of handling milk in general. Two of our cities have taken steps in the proper direction, in requiring that the milk should be sold in bottles.

In the city of Portland 183 samples of milk were taken and 83, or 45.3 per cent of these were found to contain sediment in some form. This is a slight improvement over the conditions existing there in 1910, when out of 83 samples taken, 48 or 57.8 per cent were reported as containing sediment. The requiring of a limit to the germ content of all milk sold in our cities is only a matter of time. Already the Portland Board of Health has taken steps in this direction, a move which I am sure will bring good results, and which sooner or later will be followed by other cities. In other cities the most progressive dairymen have found that the proper way to handle their product is in bottles, and so they are far ahead of the milk legislation requiring them to do so. Certainly if the men wish to handle the milk in bottles there is no reason why each city should not place such a wish on its ordinance list, for it is a great step in advance towards better milk supplies. This of course insures to the consumer that no dust from the street has entered the milk, but even then the bottling of milk has not entirely solved the dirt question.

The fact that the amount of sediment in the Portland milk decreased 12.5 per cent in a year, even though this is a small percentage, shows conclusively that results have been obtained by requiring milk to be delivered in bottles.

That the open milk pail is not conducive to best results was shown by the high bacteria counts from open pail milk exhibited at the Central Maine Fair, State Fair at Lewiston and the Dairy Conference in Portland. Sediment in the samples exhibited was a common fault, a lack of which should be expected at such times if at all. A study of the entry blanks showed clearly that the open pail milk contained the sediment and that it was impossible to strain it out.

That the percentage of samples showing sediment is so large is to be regretted by all who have the dairy industry at heart. Such conditions should not be charged against dairymen as a class, but against the individuals, and when a progressive dairy-

man, who is producing clean, wholesome milk is found, he should be encouraged.

An effort has been made to remedy the method of selling milk in stores, a very vital matter from the sanitary standpoint by reason of the fact that the poorest quality of milk is often retailed in these places with no particular care in relation to cleanliness. Believing that the sale of bottled milk in stores would remedy at least a part of the evil, I have visited 120 stores in 14 cities and towns and have endeavored to get the grocerymen to sell only sealed bottled milk and thereby protect themselves from responsibility by selling exactly what they receive. I have found the grocerymen ready to do this, as a rule, and the milkman would rather do it in many cases, for he does not want his reputation destroyed by improper handling of his milk. Milk sold from a measure that has been exposed to germ carrying flies and which is washed but seldom, is improper food to be consumed. The germ laden milk measure is bound to go the way of the unsanitary public drinking cup. The change will necessarily be slow, but nevertheless it will be sure. If boards of health in every section would shoulder responsibility, and influence city governments and boards of selectmen to pass resolutions prohibiting the sale of "loose" milk, especially in stores, the danger of disease would be greatly lessened. A state wide law in this matter would be of inestimable value, and I hope it will be an actual fact before long. That the public at large needs education as to what constitutes clean, wholesome milk, and the requirements to produce and maintain this product until it reaches the consumer, is certain.

In the quarterly bulletins the analyses of samples as well as violations of the law and prosecutions for the same, have been reported. The mailing list for these consists of about 4,000 names, including the newspapers of the State. It is the endeavor to give the public as much information as possible in regard to the quality of the milk they are receiving. The newspapers have helped greatly in this, but still many people are uninformed. The increased demand for these quarterly bulletins would show that the public are anxious to know more about what they are receiving, and rightly so. Short articles that are of benefit both to the consumer and to the farmer have been published in these bulletins, with the object of en-

lightening the reader as to the responsibilities of the public as well as of the producer of milk. The articles include "The Covered Milk Pail;" "Milk at any Price;" "The Retailer and Dirty Milk;" "Why Test Dairy Cows?" "Clean Milk."

There is another side of inspection that is perhaps too often overlooked,—the educational side for the farmer and his awakening to the need of better cows, better feeding and better management of the dairy. Since May 1st I have visited 70 milk producing farms in different sections of the State, and in visiting these different dairy farmers, changes in their present systems have been very often recommended, and those usually tend to make the milk of better quality. I have not always been a welcome visitor, for like all progressive movements, inspection has its enemies. Many of these so-called enemies are made so, not through any personal grievances but through a lack of understanding of what it is desired to accomplish. The farmer has a mistaken idea that the Inspector is his enemy, but when he understands the advantages that would come to him by improving the quality of his milk and thereby maintaining a good reputation, his prejudices are overcome to a large extent.

It is a comparatively easy task to pick out the defects on the average dairy farm and criticise them, but little good results. A dairyman has a right to ask why and how an improvement is to be made, and to this end good results have been obtained when he can be enlightened. The score card is not always practical, but when possible it has been used to great advantage.

To call attention to a few details which before seemed to be of minor importance, often is of great benefit to the farmer. Attention to details is a requisite in the dairy business, for this brings increased profit, a better understanding of the business, and a consequent sanitary improvement. The hardest dairyman to get to improve is the one whose profits are least.

The object of inspection is not to criticise but to help when possible, and it is with satisfaction that I find that many of the dairymen look at this matter in the same light, thus making my calls very pleasant. On a large percentage of the dairy farms the buildings contain what is generally termed the old fashioned tie-up, with no special reference to sunlight, ventilation or manure disposal. And too often the details of the dairy barn are left to hired help who are slack and uninterested.

It is a difficult task to get a man to change when he has been doing the same thing for a dozen years or more, and often dairymen are met with who have no use for anything different because they are satisfied with the old regime. It is the dairyman who wishes to be progressive and sees that changes are for his own benefit that welcomes inspection.

A very noticeable fault that I have found on nearly every farm visited is the lack of an adequate system of manure disposal. The practice of throwing it out of a window back of the animals seems more in vogue than pushing it through the floor. This prevents the odors coming up through the floor but does not improve the situation very much for the piles are left for many months at a time, become very disagreeable, pollute the barnyard and act as a breeding place for flies, to say nothing of the loss in fertilizing value. It is a peculiar fact that usually the road side of the barn is selected for the manure pile, and in visiting some of the best milk farms the first sight from the road, other than the buildings, is the manure pile. It seems to me it would be better to find a less conspicuous spot, as well as to keep from advertising that slack method of manure disposal.

Another feature which is decidedly lacking is the use of some sort of a covered pail, to reduce the amount of sediment entering the milk. In all of my visits I have endeavored to point out the disadvantages of the open pail and the impossibility of straining out the dirt after it is once in the milk, resulting, I am glad to say, in the adoption of a covered pail in many instances.

A certain number of minor changes, as has been said, can be stood by the average farmer, but just how much will be the added expense it is difficult to state. At present the milk business in this State is hardly a very profitable one. Everywhere farmers say they can get a living at it but not much more. The production of good, clean, wholesome milk means a change in their present method as has been shown by the large number of dirty samples taken. It means a little more time in the cow stable before milking and at milking time, more time in washing utensils, more careful feeding, a different disposal of the manure, covered milk pails, more light and air, and the use of ice in cooling and keeping the milk. Providing the farmer has

good cows to start with, all of these things and many more details must be considered by him in securing the best product. When the public understand that all of this attention to details means more time and expense to the dairy farmer, I think they will find that they are getting milk at a very cheap price as compared with the actual food value it contains and the cost of producing it, and I see no reason why he should not be favored, provided he produces the proper article.

The purpose of the Quarterly Bulletins is to enlighten the public as well as the farmer along this line. It has been stated that were a dairyman in communities where they are now producing a grade product to start ahead and act as a model for the community, advertise his methods and invite inspection at all times, the public would not be slow to recognize the worth of his efforts, as is shown in communities where this is in practice.

The average dairyman cannot make the necessary sanitary changes at once, and the desired changes are not always practical because of the expense, but a few changes at a time are within every dairyman's power, and if these are made from time to time we feel that he is progressing. We realize, as should the general public, that improvements cost money and that extensive improvements that result in a better quality of milk should be favored with an increase in price for the product. In the improvement of our milk situation there may be a stumbling block because of the disinclination of the consuming public to pay for sanitary milk what it reasonably costs to produce it. In many sections there is always a demand on the part of the consumers for something for which they are not willing to pay, and in this way something is demanded of the producers which they cannot do and stay in the business. There is right and justice in the demand of the consumer for a cleaner, purer milk, and there is equal right and justice in the demand of the producer that he be repaid the extra cost of producing this extra quality. In my opinion no amount of inspection or legislation will really avail much until the producers are adequately repaid.

I have visited 16 creameries and milk depots giving special attention to conditions influencing the quality of the product received and delivered. In every instance I have met with men whose interest is with their business and any suggestions have

been cheerfully received. Inspection has at all times been welcome for they understand that it is not for their own welfare to have inferior products sold bearing their name.

It was my privilege to be in attendance at the Brockton Fair in Brockton, Mass., where some of the best dairy stock in the country was seen, as well as the judging contest by college students. I also visited the Langwater Farm at North Easton, Mass., the home of the wonderful animal "Dotty Dimple". The trip included a visit to the Boston Inspector and to the milk plants of D. Whiting & Sons and H. P. Hood & Sons at Charlestown, Mass. Much valuable information was gained from these visits.

I was in attendance at the Central Maine Fair at Waterville and the State Fair in Lewiston, and was in charge of the exhibits of milk and cream. I also visited several of the smaller fairs, as requested. At the Dairy Conference in Portland I assisted in taking charge of the dairy products, and spoke on "The Value of Milk Inspection in This State."

Owing to the lateness of assuming my duties, the first four months' work of the year was carried on by Mr. C. W. Barber, to whom I am indebted for much valuable information in regard to the work. I also wish at this time to thank you for the assistance rendered and the favors shown me in my work. The members of the Department, the dairymen of the State, the press, boards of health of many communities, city and town inspectors and county officials have co-operated in this important work at different times, for which I am very grateful. I hope that the spirit of co-operation will be continued more closely than ever before.

Respectfully submitted,

RUSSEL S. SMALL,
State Dairy Inspector.

REPORT OF FIELD AGENT, SEED IMPROVEMENT WORK.

To the Hon. J. P. Buckley, Commissioner of Agriculture:

I respectfully submit the following report of my work in the Maine Department of Agriculture from January 1st, 1911, to September 20th, 1911, at which time I resigned to continue studies in the University of Maine.

During the first four months of this year my duties consisted of those pertaining to the investigation and sale of dairy products. Besides inspecting dairies and securing samples of dairy products considerable time was devoted to a revision of the laws pertaining to the production and sale of milk and its products. Considerable difficulty arose in the prosecution of certain cases owing to technicalities and general limitations of the law in effect and as a consequence those interested in the production and marketing of clean milk set about to secure the enactment of laws that would be wider in application and better for all concerned in the preservation of the public health.

An act passed by the legislature of 1911, embodying many points of laws governing the sale of milk and its products in other states now gives greater protection to the public against adulterated milk or milk below standard and unsanitary dairy products. Besides this law the following laws were enacted this year for the protection of public health against impure milk and dairy products.

An act requiring the cleansing of all milk cans or vessels before being returned to dairymen shipping milk; an act relative to the sale of oleomargarine. Of further importance to the dairy business there was passed an act decreasing the fees for sealing milk bottles and cans and also, an act making milk bottles and cans sealed by the sealer of weights and measures in any town legally sealed for every town in the State; and an

act relative to the standard milk can. The present Dairy Inspector will undoubtedly submit in his report the total number of samples of dairy products obtained this year and I will not take further space regarding my work in the investigation of the production and sale of dairy products.

On May 1st I assumed the duties of Field Agent in charge of seed and plant improvement work as carried on by the Department of Agriculture in conjunction with farmers, especially those who are members of the Maine Seed Improvement Association. In fact, prior to May 1st considerable of my time was devoted to making plans for this season's work. Varieties of oats and wheat, together with corn, were sent out by the Department of Agriculture to about thirty members who desired seed for a basis of selection and improvement. All seed sent out to farmers was tested for germination. The only trouble with sending out seed corn for variety tests is that corn is so delicate that it is susceptible to ready changes when planted only a few miles from the region where it has developed during previous seasons. Hence, the farmer would ordinarily do better in breeding corn to select the best varieties that have become acclimated to the region wherein his farm is situated. In the future it would seem advisable to encourage this practice and not send out varieties of corn from the Department of Agriculture unless some particularly meritorious variety should be tested out. In the problem of improving grains the Department of Agriculture could do a most valuable service by sending out to farmers a few of the standard varieties of oats, wheat, barley or other grains in order to find out to what conditions each variety was best adapted and the most productive strains to grow under widely differing conditions of soil and climate in this State. Five tenth-acre plots of grain on each of two farms in each county of Maine would certainly yield some valuable data relative to the value of different grains.

In regard to the improvement of potatoes, one of the first requirements should be to determine exactly what types of potatoes the southern seed trade and other markets demand. More should be known about potato markets and their requirements so that Maine farmers interested in the production of potatoes for seed stock could have some source of information relative to varieties of potatoes that it is desirable to grow

and how to market the same. This, it seems, would be of great benefit to farmers and, in fact, such information has often been requested by them.

The present high prices of grass and clover seeds would apparently be sufficient reason for mentioning the production of such seeds on Maine farms as being an advisable problem for farmers to consider. Years ago nearly every farmer produced grass seed sufficient for his own farm and to-day there is considerable agitation as to the advisability of growing such seed. A study of the growing of grass and clover seeds in other states ought to be made in order to determine something in that line that can be carried out with good results on Maine farms.

During the past season I have been to the farms of 143 members of the Maine Seed Improvement Association and of these 25 were visited twice. Besides going to these farms I have examined crops on 25 farms not managed by members of the association. To try to do work, experimental work, with so large a number of farmers is entirely out of reason if one expects to attain any valuable results in plant breeding. On this number of farms it is practically impossible to inspect the crops more than once during the season and then not sufficient time is allowed. This matter of crop improvement requires considerable time with each individual farmer in order that the work shall be done in an accurate manner. By co-operating with two farmers in each county it would be possible to carry out plant improvement under widely varying conditions and when these farmers were well started and able to carry on the work without much attention from the Department of Agriculture other farmers could become co-operative experimenters. This plan would develop in each county two farmers from whom in two or three years' time it would be possible to procure seed that had proved valuable for their immediate vicinity. Hence in a few years the farmers would have a source of standard grains in each county and such acclimated seed would certainly be more dependable than the seed now secured. In this plan could well be considered the improvement of corn, potatoes, grains and grass seeds. Again, any scheme of crop improvement which does not look forward to a financial return to the farmers engaged in the improvement of plants can not be pro-

ductive of results. If the experimenter—the farmer who tests out plants—is able to demonstrate the value of improved seed corn, oats, potatoes, etc., to fellow farmers of his community, there will soon be developed a market for all the seed he is able to grow and the neighboring farmers will have an actual demonstration of the value of pure standard seed. Instead of sending money to other states for seeds Maine will be developing seed farms within her own boundaries. By limiting this work to co-operative tests on a few farms, it will be possible to secure greater concentration of effort and quicker returns, or results. Each farm can be inspected two or three times during the season and a careful supervision of the work may be had, together with complete data regarding growth, yield, etc.

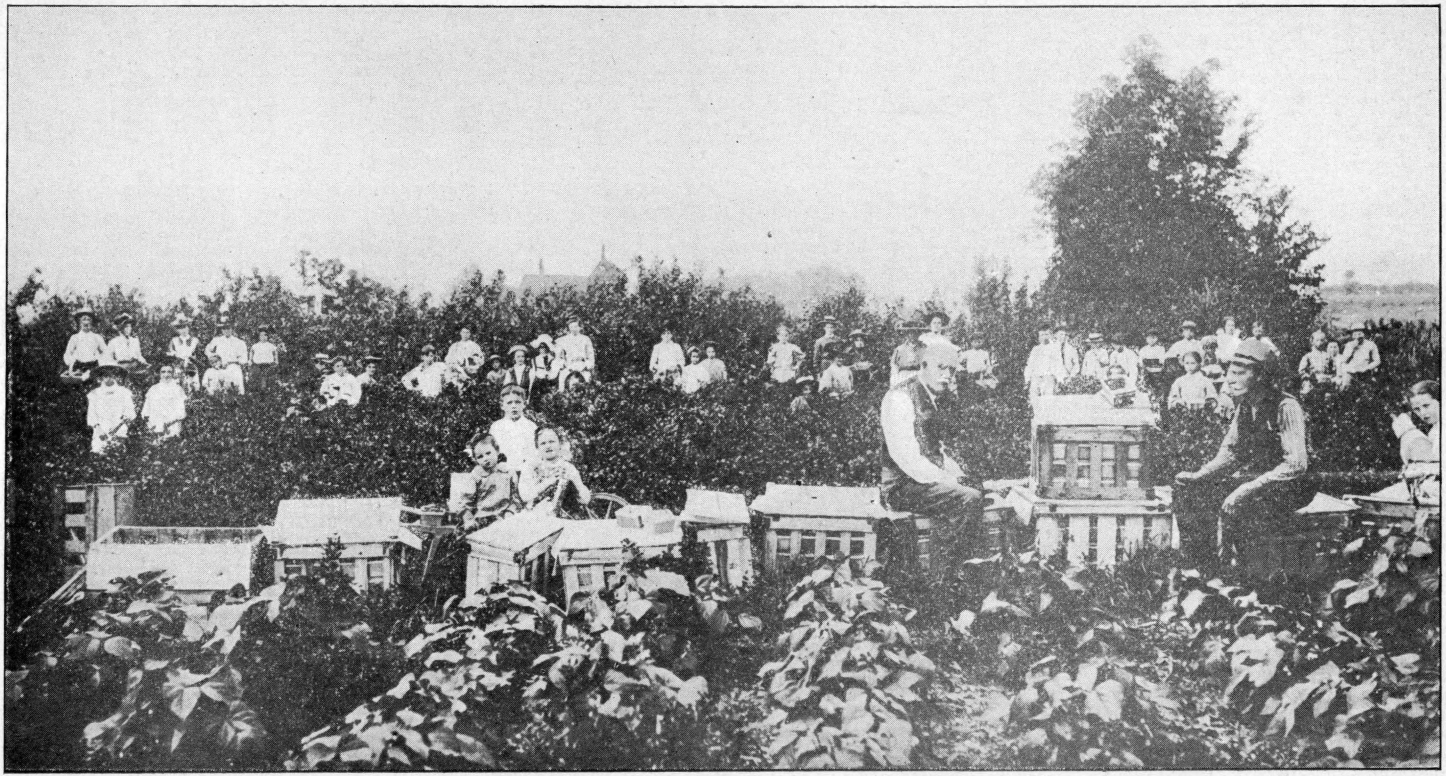
In addition to experimental work considerable effort must be used in familiarizing farmers with the best methods and practices of crop improvement, and also, with the ways and means of marketing the same. By carrying on experiments as outlined above it will be possible to secure some valuable data regarding crop production in this State and hence, being produced under conditions peculiar to this part of the country, the results will be all the more valuable. A bulletin on seed improvement work for Maine farmers should be published this spring and such a pamphlet ought to take up in detail the best methods and practices in its plans for the improvement of different farm crops.

In addition to my duties as outlined in the foregoing paragraphs I spent one week in attendance at the exhibits at Central Maine Fair, Waterville, one week at Maine State Fair, Lewiston, and two weeks in preparation of exhibits and in attendance on the Northern Maine Farming Special. From this train I delivered four lectures on seed and plant improvement. Also I devoted five days' time to getting ready for shipment to the U. S. Bureau of Standards the State of Maine standard weights and measures and in quest of information relative to the work of the sealer of weights and measures. Further time was devoted to institute work. I attended ten meetings with an attendance of 533.

I highly appreciate the assistance granted me by you and the members of the Maine Department of Agriculture.

Respectfully,

C. W. BARBER.



Fruit Farm of A. A. Eastman, Dexter, Me.

REPORT OF STATE HORTICULTURIST.

To the Hon. J. P. Buckley, Commissioner of Agriculture, Augusta, Me.

I herewith submit my first annual report as State Horticulturist for the season of 1911.

Owing to the fact that I was unable to take up my duties until the 15th of May, the work of the department was ably carried on under the direction of Mr. Yeaton. My report must necessarily, then, be but a partial report, and is rendered as such.

From the standpoint of the orchard it is safe to say that the year has been particularly successful. The early and long continued drought which was so detrimental to some of the crops, did no particular harm, especially in the orchards where cultivation was practised.

The early drop was heavy but enough fruit was left on the trees to insure a fair crop. It is estimated so far that the product reached 1,000,000 barrels, a 15% increase over last year. The fruit was very highly colored and of good size and showed to good advantage at the different fruit exhibitions.

Lack of co-operation, except in a very few instances, resulted in low prices in various localities and demonstrated more clearly the need of work along this line.

We organized the Oxford Bears Fruit Growers' Association, the 26th of June, and their work has been very successful thus far. This is the only association actually formed, though the prospects for such work are very bright in a number of localities.

More interest has been shown in box packing of apples and the box is gaining favor amongst the growers of fancy fruit. It is out of the question to pack inferior fruit in boxes, however, as the financial returns will be no greater than from the barrel unless very strict grading is practised. Wrapping should

always be practised where fruit is put in boxes, not only because of the more attractive appearance, but because of the fact that spread of decay and danger from bruising, especially in a loosely packed box, are greatly lessened.

The different insects were busy during the season and a great deal of damage resulted. The bud moth began its work early in May and was followed by the brown-tail moth, canker worm, old tussock, coddling moth, railroad worm, fall web-worm and borer in greater or less quantity. In the young orchards the aphis (green) appeared in large numbers and worked havoc where left alone. For diseases the canker was an easy first in damaging the trees. Scab was commonly seen on some varieties, particularly the McIntosh, and constituted the principal disease of the fruit.

Crown gall and woolly aphis gall appeared on little of the nursery stock introduced into the State and in most cases the growers did not plant the infected trees.

The scale insects were common with the exception of the San Jose scale.

Of the small fruits, the raspberries probably suffered most during the season and about half a crop resulted. Winter injury, insects, diseases and drought all contributed to a small production of rather inferior berries.

Strawberries suffered also from the long drought and resulted in not over a 60 per cent crop. The extremely hot weather of July caused the gooseberries to drop in great quantity. Currants did as well as any of the small fruits and gave a fair production. Blackberries were rather below par in size and tended to be hard and imperfect.

Of all the small fruits, probably the blueberry, if it can be so classed, netted as good a financial return as any, when the capital invested is considered. The growers in Washington county especially, are enthusiastic over the chances for development in this line in the future, and it would seem that their enthusiasm is well founded.

Inquiries have been received from states as far west as California, regarding the culture of the berry, showing the wide distribution and favorable reception given it.

There are a few cranberry bogs in the State and they appear to be in good condition. The water problem seems to be the

greatest obstacle in the way of the development of the business. A great deal of our cheap soil is very well adapted to the plants, resembling the soil of the New Jersey bogs rather than those of Cape Cod. The question has not been sufficiently investigated, however, to tell whether or not cranberry growing will be profitable in this State on a large scale, especially as the demand is somewhat limited at the present time and the output controlled by an exchange.

BUD MOTH.

Early in May small twigs of apple trees, showing the work of an insect, began coming into the office, and letters asking for identification.

From then on until the first of July, the larvæ of the bud moth could be found upon a fairly close examination of buds or leaves. In Kennebec and lower Oxford counties, their work was most noticeable but there was more or less damage done in all of the fruit sections.

CODDLING MOTH.

As usual the coddling moth caused more loss to the fruit growers than any other pest. Even where spraying was done, trouble was found in controlling this pest in a satisfactory manner. Some of the growers estimated that as high as 95% of their fruit was free from worms and fit for the fancy grade but these men were not by any means numerous. Probably 60 per cent, at least, of the unsprayed apples were wormy and unfit for fancy pack, and somewhere in the vicinity of 20% of the sprayed fruit also.

The failure of the spray material to control this pest was due in many cases to lack of thoroughness and delay in application rather than to the material itself. Even with the evidence of the many advantages of sprayed fruit before them, most of the orchardists believe that they have not time to spare from other work, to spray their trees more than once during the season.

To raise perfect fruit it is absolutely essential to spray the trees immediately after the petals fall and to do so in a most thorough manner, in order that each calyx cup be finely covered

with an arsenical poison. Probably 80% of the larvæ of the moth enter the calyx end of the apple so that the importance of the poison at that point is readily apparent. The cup closes rapidly and if spraying is delayed too long it is impossible to force the spray into the interior.

SAN JOSE SCALE.

Up to this last season but four infestations of the San Jose scale had been found in this State. This year we found but one infestation and that in a nursery in Eliot. One tree was discovered badly infested and was at once carefully taken up and burned. The remaining trees were gone over very thoroughly but as far as could be determined at that time, no others were infested. Specimen branches have been sent in and orchard investigation asked for in some cases but always the pest has been other than this scale. The chief danger of introduction is through nursery stock, and provided trees are bought from good nurseries at a normal price we should keep free from it.

RAILROAD WORM.

Next to the coddling moth, the apple maggot, better known by the popular term railroad worm, rendered the most fruit worthless.

The Tallman Sweet, Fameuse, Nodhead and the sweet apples in general suffered most, though the acid and sub-acid varieties were not exempt. It is hard to control this pest in a satisfactory manner, as spraying is not entirely effective and it is almost impossible to keep all of the windfalls picked up, especially those which fall early in the season before reaching maturity.

It is particularly hard to fight this pest if the neighbor on the right or left neglects to care for his orchard, as the adult flies are capable of flying from one orchard to another.

The use of sheep and hogs has often been recommended as a practical method for controlling this pest. Neither are entirely satisfactory, however, inasmuch as the latter are apt to cause post-season growth, resulting in winter injury and as the former prefer the foliage and low hanging fruit to the windfall.

Deep spring plowing has proven as effective as any of the preventive methods and is to be greatly encouraged.

BORER.

The round-head borer has been as persistent as in previous seasons. Once in the tree they are rather hard to oust. During their first season's operation, they can be cut out easily with a sharp knife and this method has been chiefly adopted. Later, when they have burrowed about in the wood, it is a difficult proposition to combat them successfully. One grower has had good success in using a small quantity of formaldehyde, injecting it into the hole and sealing the opening with wax. The insect is killed and the formaldehyde, which is already contained in the tree juices, apparently does no harm. This method is particularly effective when depending upon hired help as an inspection of the trees will tell whether or not they have been treated.

Prevention is much more satisfactory and in most cases, easier. Tar paper is effective in keeping out the borer, but is very apt to smother the tree and cause a diseased condition of the bark, resulting later in diseased wood. Fine mosquito wire painted to render it more durable, has been more successful than anything else. Provided it doesn't touch the bark at any point, it is an almost sure preventive as the beetle will not crawl over the top in the attempt to lay the egg. In some cases the beetle has laid the egg through the mesh of the wire, where it fitted closely to the tree. Such cases can be prevented by careful adjustment of the wire. Where the trees were sprayed with lime-sulphur or washed with the soap solution, less evidence of the borer was seen.

BROWN-TAIL MOTH.

Owing to the prompt, and in most cases efficient, work of the town officials, the ravages of this pest have been kept within bounds, and the foliage of our shade trees in general has not suffered to any great extent. The actual number of moths, however, has greatly increased, and more egg clusters and nests have been found this fall than ever before. Not only has the number of nests greatly increased in the localities already infested, but footholds have been gained in new locations and the boundaries to the north and east have been greatly extended. The nests penetrate much farther into the forest and will

soon be beyond control of the city or town authorities. In the orchards that have been sprayed during early summer with some arsenical poison, no trouble has been found in controlling their depredation. This is the most satisfactory method inasmuch as other pests, including the fall web-worm, can be controlled at the same time; the expense outside of buying a spray pump, is no greater, for no man can get all the nests by going over the trees once and must make two or three inspections; and there is not the great loss of new growth through cutting back.

CANKER.

Of all diseases, canker has been the worst. Many trees have been killed outright and many others have been rendered practically valueless because of the ravages of this disease.

Gaining a foothold anywhere that permits and spreading by natural means and by pruning saws, it has gone through some orchards like wildfire. It has often followed winter injury and worked under the bark so that it has not been discovered until the bark has fallen off and the wound been exposed.

In the demonstration work the method of handling was carefully gone over so that the growers could get an insight into the care of their trees when infected.

The failure to paint over the scars when pruning has been instrumental in many cases, in bringing canker into an otherwise healthy orchard.

Additional plant food and heavy pruning will go a long way in bringing back many of the trees that appear to be in a dying condition. Spraying with the dormant strength lime-sulphur will tend to keep it in check and prevent its spread, but is not a perfect remedy when the tree is badly infected.

The natural fruit trees, even when top-worked to some standard variety, appear to be more resistant to the disease.

SCAB.

This disease did not appear to any great extent this season. The continued dry and sunshiny weather at the time that it usually appears, probably accounts for the relatively small amount of fruit infected.

As the McIntosh at the present time is our most fancy apple and as it is being planted as much as, if not more than, any other variety, it is especially important that we keep this disease under control; inasmuch as the McIntosh is the variety that suffers more than any other because of it.

Apples in sod have appeared to be less resistant to this disease than those under cultivation, showing that it isn't entirely a question of spraying. Cultivation aids at all times.

SPRAY MATERIALS.

Inasmuch as Bordeaux mixture has, in many cases, proven very unsatisfactory in orchard spraying, we have recommended the use of lime-sulphur instead. Thus far very little complaint has been made of burning the foliage and there has been no russeting as far as I know. As both a dormant and a summer spray it is proving to be the best. Growers that have tried home boiling have had varying success but a majority have been well satisfied with the results. The mixture has not been as concentrated as the commercial but the effect upon scale and fungus has been as satisfactory and the expense much less.

Arsenate of lead has been recommended as an insecticide, as it is effective and clings to the foliage longer than any of the other materials. Paris green and arsenate of lime are both apt to burn the foliage and their use has been discouraged for that reason.

Arsenate of zinc is being heralded as a high quality spray material and has proven satisfactory in many cases where it has been given a trial. Its use will depend upon future results and it might be well for growers to try a little in their spring work. It is much cheaper than the lead and if as effective, will largely take its place in spray work.

Many inquiries have constantly come in regarding fungicide and insecticide manufacturers and spray pump manufacturers. The following is a partial list recommended:

FUNGICIDE AND INSECTICIDE MANUFACTURERS.

Frost Insecticide Co., Arlington, Mass.
Grasseli Chemical Co., 172 E. 5th St., St. Paul, Minn.
Sherwin-Williams Paint Co., Minneapolis, Minn.
Bowker Insecticide Co., 43 Chatham St., Boston, Mass.

Merrimac Chemical Co., 33 Broad St., Boston, Mass.
Niagara Spraying Co., Middleport, N. Y.
Geo. E. Talmage, Madison, N. Y.
Kentucky Tobacco Product Co., Louisville, Ky.

Spray Pump Manufacturers.

Hardie Mfg. Co., Hudson, Mich.
F. E. Meyers Bros., Ashland, Ohio.
Frost Insecticide Co., Arlington, Mass.
Crown Speciality Co., Box 297, Chicago, Ill.
E. A. Brown Co., Rochester, N. Y.
Bean Spray Pump Co., Cleveland, Ohio.
Barnes Mfg. Co., Mansfield, Ohio.
Fairbanks Morse Co., St. Paul, Minn.
Friend Mfg. Co., Gasport, N. Y.
Niagara Sprayer Co., Middleport, N. Y.
Spramoter Co., Buffalo, N. Y.
Goulds Mfg. Co., Canton, Ohio.
Hurst Mfg. Co., Canton, Ohio.
Field Force Pump Co., Elmira, N. Y.
Deming Co., Salem, Ohio.
Thomsen Chemical Co., Baltimore, Md.
Vreeland Chemical Co., 50 Church St., New York City.

Points Essential to a Good Outfit.

1. Brass lining.
2. Good agitator, that can be worked separately.
3. Nozzles that do not clog easily or catch in foliage.
4. Good size and chamber to allow for pressure.
5. A good strainer.
6. Good hose.
7. Bamboo extension rods.

NURSERY STOCK.

Although during the past season the amount of cheap and inferior nursery stock introduced into the State has been greatly reduced in comparison with former seasons, we still are paying good money in purchasing practically worthless stock. For many of us are willing to buy whatever the agent has to sell, without looking into the standing of his firm.

As an appeal to the buyer, would say,—first inform yourself through your neighbor's experience, secure catalogues with the accompanying price lists in order to get a check on the agent, write the nursery firms and ask questions, ask information from the editor of your paper; and secondly, use common sense.

Some of the growers that have had little experience in buying stock have been held up for exorbitant prices; others have paid 10c per tree and obtained stunted stock, as might be expected.

I believe thoroughly in the one-year-old seedling, and have urged its use in this State. I find that where the one-year-old and two-year-old seedlings are given a fair trial the difference in size and yield at the end of ten years is not noticeable and that the one-year-old has developed into the strongest and thriftiest tree in a majority of cases. The one-year-old costs less, its system does not receive the same shock in transplanting and it can be pruned to the grower's own satisfaction, with little chance for weak crotches later on when the trees are loaded with fruit.

Many growers are constantly inquiring why there isn't a good nursery in this state. At present there are two nurseries that are growing apple stock in greater or less quantity. Mitchell & Co. of Waterville have about 50,000 one-year-old seedlings and 40,000 budded this fall. On inspecting the one-year seedlings we did not find them black-hearted as might have been expected from the experience of former trials by other nurserymen. The Hancock Nursery Company have about 2000 apple seedlings also free from black-hearts when inspected. Both companies have many of the standard varieties and as far as can be determined, are reliable.

RENOVATION OR REMOVAL?

There is no question but that we have too many blocks of old trees existing in different parts of the State. Some of them still produce fruit and are fairly vigorous, others are diseased and if fruit is produced, it is simply food for insects or a harboring place for disease.

In going through an orchard of this kind, the question is always asked, "Would you advise dehorning or removal?" and it is a question that is hard to answer in many cases.

Where the trees are vigorous and not too old, say 50 years, they can be dehorned to advantage in many cases, and after a new top is formed nearer the ground, be made very profitable. Such trees have usually been trimmed as if they were shade trees and the top is 25-30 feet from the ground. This renders production expensive and spraying almost prohibitive. By

removing, say one-third of the top, every other year and forming the top from the new shoots, the work of renovating can be easily done. This method requires careful pruning else the growth will be too rapid and winter injury will result.

Often in order to start the top low enough it is necessary to cut below the original graft and new scions have to be set.

In contrast to such trees old hulks are found with little top and rotten and decayed trunks. They are hardly worth giving a moment's thought and should be made into fire wood as soon as possible. Not only are they worthless but they act as breeding grounds for the different insects that prey upon the fruit and foliage. The loose bark and abundant crevices afford ideal quarters for such insects and they are not slow to take advantage of them. In the interest of good fruit such trees should be condemned.

PRODUCTION.

It has been estimated that nearly 30,000,000 barrels of apples were produced in the United States during the season of 1911.

Our crops will reach the 1,000,000 barrel mark in all probability, an increase of about 15% over last season.

These apples were produced largely in Oxford, Franklin and Kennebec counties, although some of the finest fruit was produced in other sections. This estimate constitutes only about 60% of a full crop and demonstrates how powerful a factor we can become in the market if we will care for our fruit and make our packs attractive and honest.

We hear a lot at present about over-production because of the extensive plantings in the Atlantic and western states. This bugbear has tended to discourage many growers from increasing their orchards.

Fifteen years ago, or to be specific, in 1896, the production of the United States was sixty-nine odd million barrels and in 1895 it was sixty million, showing that the production has fallen off about one-half since that time. The demand and consumption have increased rapidly since then until at the present time, the apple has become a necessary part of the diet.

Competition is becoming keener but many of the states that produce the finest fruit, are badly handicapped by heavy trans-

portation rates. The cost of sending a bushel of fruit from Hood River to New York City is $.50, as much as the estimated cost of production.

Facilities for producing and handling are being improved each season and a great deal is being expended by the Government each year in devising methods to still further improve conditions. Improved facilities, increased consumption and better methods of transportation will all tend to offset the increased production.

Early frosts have done little harm in the State thus far and we are not subject to continued droughts, the principal danger being from winter injury.

CO-OPERATION.

The subject of co-operation is one of the most vital importance to the present day grower. The profit from the orchard depends not only upon the ability of the grower as a producer but upon his ability as a salesman as well and it is only in exceptional cases that the two are combined to the best advantage.

The improved methods of handling the trees and growing fruit have gone a long way in making the fruit growing a profitable business but the question does not stop here. Can the grower realize a greater profit? if so, how?

Provided a large percentage of fruit is fancy, the only way to increase the profit in this direction lies in greater thoroughness and more efficient machinery. Not a great chance for a radical increase in profit surely. We must look farther into the question, then, and find possible "leaks" in another direction.

The question of disposing of fruit to the best advantage is one that has been the subject of much thought and discussion for many years, ever since fruit has been grown commercially, in fact.

Unsatisfactory results from commission men, a greater production of fancy fruit and keener market competition have all aided in making the question of paramount importance to the grower. With the adventure of co-operation in other industries, the progressive growers in the West foresaw great chances for improvement in the marketing of their fruit by this method. As a result, Fruit Growers' Associations were formed and have

been largely instrumental in very materially raising the price of fruit during the last few years. As an example the Hood River Spitzenburgs which sold for $.85 per box before the associations were formed, are now selling in quantity at $2.50 per box. These results are due to the efforts of a relatively small number of men who have tended to place the fruit industry in that section upon a firm and stable basis. Land values have trebled, and prosperity is general rather than individual.

In general, wherever co-operative organizations have been formed, increased prosperity has followed. Probably the greatest concern of this kind is the California Fruit Growers' Exchange, which deals with the citron fruits. It is the central organization for sixteen sub-exchanges, marketing for ninety-eight sub-associations in California.

During the season of 1910, $58,000,000 worth of fruit was marketed and the estimated crop (on the trees) for 1911 was 45,000 cars. It has been operating for 15 years and 80% of the growers still ship through it, showing that it must have been to their interest to do so.

In the Northwest an apple exchange has been formed and is rapidly absorbing the individual associations and will in all probability, control the apple output of the entire Northwest in a few years.

Why not such an exchange in the East? True, we will first have to form small associations upon a business basis and develop men capable of managing such a concern, but greater things have been accomplished and by the awakened interest along this line, it would seem feasible. In the meantime, attention must be given to local associations.

Perhaps an outline of some of the advantages and disadvantages of such a union would be profitable.

The following are some of the advantages:

1. Enables the small grower to ship in quantity.

2. A particular brand can be established that will be sought after, thus insuring better prices.

3. The crop can be distributed so as to prevent gluts on the market and insure uniform prices.

4. Better business methods can be adopted in dealing with commission men, etc.

5. Insures better care of the orchard, hence better fruit and more regular crops.

6. Gives a community a greater prestige and stability.

Some of the disadvantages:

1. Independent growers not in the Association, get many of its benefits.

2. Difficulty in keeping quality of the fruit of the Association as high as that of the best independent grower.

3. Spirit of jealousy and lack of confidence.

It will be seen that the success depends largely upon the individual members; if the spirit of mutual help is lacking, failure, or at best, only partial success follows.

Mr. Wilson Conant, President of the Oxford Bears Fruit Growers' Association, in speaking before the agricultural class at the University said, "Never urge a man to join an association; if his judgment does not tell him that the proposition is a sound one, he will not be worth having as a member."

This seems to hit the nail on the head and if the organization is formed with that idea in view, there is little doubt as to its success.

GREGORY CONTESTANTS.

The contestants for the Gregory prize have been very backward in sending in the returns from their acre of orchard this season and a second set of report blanks had to be sent to a great many of them. As a result any data that may be mentioned below has been compiled from an incomplete list and may not be strictly accurate. It will give some idea, however, of the principal points of interest in the reports, and be useful until the full report is printed later.

Each grower has done some pruning, mostly so as to form an open top; less than half have sprayed the trees and various materials have been used, arsenate of lead predominating as a single material; the number of applications where spraying was done averaged about two times and show results in the insect column; nearly all either had a cultivated crop or practised clean cultivation till the middle of the summer; most used fertilizer in some form, either barn yard manure or some commercial grade. Corn, garden and potatoes were the favorite crops planted in the orchard; the number of trees reset averaged about

three and ranged from thirty-six down; the chief insects were green aphis, brown-tail moth, fall web-worm and borers.

The reports sent in correspond with the notes taken by Mr. Yeaton and myself thus far.

The following list comprises the list of contestants as revised. A few have dropped out or sold and a few new ones appear whose returns were not received in time to print.

LIST OF CONTESTANTS FOR THE GREGORY PRIZE.

NAME.	P. O. ADDRESS
Abbott, Horace P	Eliot
Adams, Fred L	North Jay
Allen, Harold	Hope
Bailey, L. Adelbert	Cedar Grove
Bailey, Roscoe G	Wiscasset
Bean & Son, C. S	Wellington
Bearce, H. W	Hebron
Benner, D. M	Monmouth
Berry, H. P	Livermore Falls
Bickford, Anson M	Oakland
Bishop, Dr. Heber	Allen's Mills
Blaisdell, A. L	Winterport
Blake, J. A	Farmington
Bragger, Bessie Wentworth	R. F. D., Dexter
Bragger, Wm. B	R. F. D., Dexter
Bridges, Chas	Foxcroft
Bryant, C. A	Livermore Falls
Bryant, J. B	Buckfield
Bryant, James I	Buckfield
Burdick, John A	West Auburn
Burns, E. L	Oxford
Burns, S. L	West Eden
Calderwood, Jesse F	Union
Campbell, Earl W	Clifton
Carter, John Wm	Mt. Desert
Chapman, D. A	R. F. D., Monroe
Chase, Isaac	R. F. D. 2, Buckfield
Chipman, Chester E	South Poland
Cobb, S. E	Oxford
Conant, E. E	Buckfield
Cummings, R. L	West Paris
Currier, Frank C	Morrill
Daggett, Sumner T	Foxcroft
Davis, E. E	Burnham
Davis, Owen R	Bryant's Pond
Dean, J. L	Waterville
Dingley, F. A	South Casco
Dixon, E. S. & Son	Sabattus
Dole, J. L	West Buxton
Dolloff, E. W	Standish
Douglass, Rothens A	Bowdoinham
Dow, O. B	Monroe
Dresser, H. F	Turner
Dunham, Harry E	R. F. D. 1, Phillips
Dunton, C. A	Hope
Eastman, C. H	R. F. D. 35, Oakland
Eaton, Harvey D	Waterville
Edgecomb, E. S	Bowdoinham
Edgecomb, Percy S	Belfast
Emery, H. G	Kittery Depot
Emery, Osmond	Marlboro
Everett, P. V. & Son,	Hebron
Fay, W. L., & Call, B. L	Dexter
Fifield, M. S	R. F. D. 5, Augusta
Fisher, Sumner	Winterport
Flint, Arthur E	Bridgton
Ford, L. H	Whitefield
Ford, W. C	Whitefield
French, C. A	Temple
French, E. O. & W. A	Norway
Frost, Augustus C., & Son	Wales
Gage, Irving O	Winthrop
Gay, Chas. T	Farmington
Gilman, A. W	Foxcroft
Gleason, George	Union
Goodrich, W. W	Berwick
Graves, Wm W	Topsham
Greenleaf, Ausbury C	Farmington
Griffin, John C	Skowhegan
Grinnell, H. L	Union
Hall, A. B	Addison
Hamilton, John E	Garland
Hardy, Arthur J	Dryden
Harriman, Chas. D	R. F. D. 3 Belfast
Hathaway, Gilbert T	Auburn
Herrick, A. A	Norway
Hescock, Chas. H	Foxcroft
Hills, Rufus P	Belfast
Hitchings, E. F	Waterville
Hobbs, Miller B	R. F. D., Union
Hussey & Genthner	Guilford
Irish, F. S	Turner Center
Jillson, Elmer D	Greene
Johnson, Everett E	Hebron
Johnson, Wm. P	Cumberland Ctr.
Jones, C. L	Corinna

NAME	P. O. ADDRESS
Keene, Alton A.	East Hebron
Keene, Frank Henry	Belfast
King, J. H.	Bowdoinham
Lachance, Louis	Lisbon
Lane, A. W., & Sons	R. F. D. 39, Waterville
Lane, Francis E.	Litchfield
Lannigan, H. H.	Mt. Vernon
Lash, Jesse D.	Waldoboro
Law, J. Wesley	Union
Leavitt, Arch D.	Turner
Lee, Lyman K.	Foxcroft
Leighton, Dr. Ralph P.	Harrington
Leland, Will E.	Sangerville
Leland, W. E., & Son,	Mechanic Falls
Loring, Fred H.	Guilford
Macomber, A. C.	Dryden
Macomber, E. W.	Winthrop
Maine Sanatorium Farm	Hebron
Marcotte, Leon T.	West Poland
Matson, Joseph	Solon
McFadden, Orrin	Cedar Grove
McNaughton, A. J.	Foxcroft
Meade, Chas. K.	Greene
Merrill, Chauncey Dean	Auburn
Moon, Curtis	West Sullivan
Morang, Carrie E.	Ellsworth
Morang, C. L.	Ellsworth
Morrill, Willard A.	Belmont
Morse, Wilson M.	Waterford
Nason, Chas. E.	Wiscasset
Nason, Harry J.	Saco
Nealley, Bertha E.	Monroe
Newman, Herbert L.	Mariaville
Nichols, H. A., & Jack, L. A.	Lisbon Falls
Oakes, A. A. & Sons	Farmington Falls
Osgood, Chas. F.	Garland
Packard, James R.	Monmouth
Page, E. D.	Bangor
Page, Ernest E.	East Corinth
Patten, Mrs. Lois W.	Skowhegan
Patten, Ralph J.	Topsham
Patten, Roland T.	Skowhegan
Paul, Delbert	Morrill
Peters, Dr. Wm. C.	Bangor
Peters, Mrs. Wm. C.	Bangor
Pettingill, Geo. W.	Livermore Falls
Phillips, Willard H.	Hancock Point
Plummer, S. Lyman	Lovell Village
Potter, Warren J.	R. F. D. 18, Litchfield
Ralph, W. B.	Waldoboro
Reaves, A. F.	Bowdoinham
Ricker, F. A., & Sons	Turner
Ricker, Geo. B.	Cherryfield
Ricker, W. J.	Turner
Rose, Stephen W., & Sons.	Greene
Saunders, I. F.	East Hebron
Saunders, I. F., & Son	East Hebron
Savage, Mark N.	Lewiston
Sawyer, A. A.	Winthrop
Scott, E. D.	Harrington
Shute, Herbert C.	R. F. D. 4, Ellsworth
Small, George R.	Cumberland Ctr.
Small, R. H.	Harrington
Smith, Anna	North Gorham
Smith, M. B.	Belfast
Soper, F. M.	Winthrop
Spaulding, Leslie C.	Mechanic Falls
Sprague, C. E.	Skowhegan
Sprague, Mrs. P. C.	Skowhegan
Strout, George E.	Milbridge
Sturtevant, Ernest W.	West Peru
Swain, John P.	Farmington
Thurston, Raymond E.	Union
Towns, Frank L.	Madison
Tucker, Herbert M.	Canton
Tukey, Daniel P.	New Gloucester
Twitchell, Geo. M.	Auburn
Vaughan, Wm., Jr.	Belfast
Verrill, H. M.	Portland
Vickery, J. F.	R. F. D. 3, Belfast
Walker, George W.,	R. F. D. 1., Wiscasset
Waterman, George W.	New Gloucester
Watson, Dr. W. L.	Monroe
Webber, Fred A.	North Jay
Weeks, Wm. A.	R. F. D. 5, Farmington
Wentworth, Frances Towle	Exeter
Wirth, Jacob	Farmington
Worcester, W. H.	Columbia
Wyman, F. D.	Lincoln Center
Yeaton, G. A.	Augusta
York & Sons, C. A.	Bangor
Young, H. G.	Brunswick

NURSERY INSPECTION.

The number of nurseries in the State would appear to have decreased during the past season, in comparing the lists for the two seasons. This is due to the fact that strawberry growers are not listed among the nursery men inasmuch as no troublesome disease has been found that would prevent shipping of stock.

San Jose scale was found in only one nursery and that had been brought in from out of the state. Careful attention was given to stock going to other states, insuring freedom from brown-tail moth infestation.

The following is the list of nurseries inspected during the season of 1911.

LIST OF NURSERIES IN MAINE.

General.

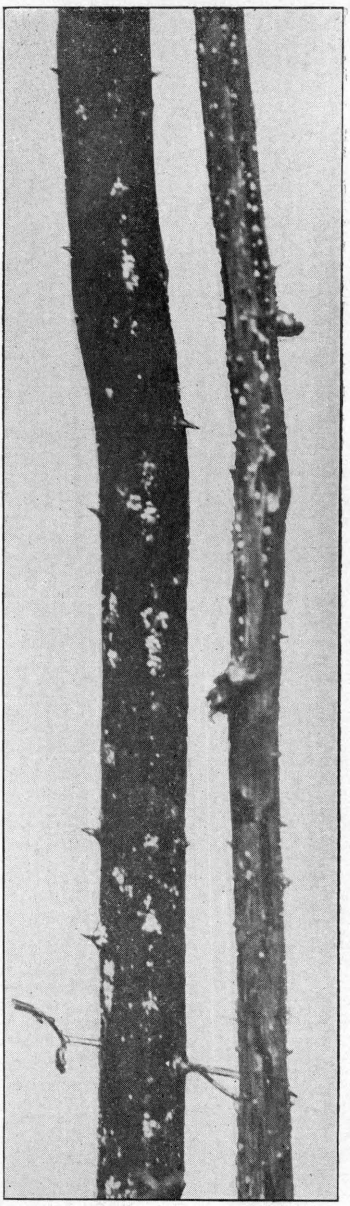
Casco Bay Nursery Co., Yarmouth.
Fernald, W. Linwood, Eliot.
Glaentzel, Geo. H., Camden.
Macomber, E. R., Woodfords.
Mahoney, Geo. L., Saco.
Minot Co., J. W., South Portland.
Perley, C. A., Winthrop.
Smith, T. A. W., Biddeford.
Strout's Nursery Co., Biddeford.

Small Fruits.

Ball, Henry A., Hancock.
Ball & Son., H. D., Hancock.
Bodge, A. R., Dexter.
Chadbourn, J. A., Bridgton.
Chaput, J. P., Auburn.
Conant, A. A., Hebron.
Elm Brook Farm Co., Farmingdale.
Glidden, Mrs. G. M., Gardiner.
Goddard, L. C., Woodfords.
Gould, C. E., Woodfords.
Green, Edmund, Gorham.
Grover, E. A., Freeport.
Hancock Nursery Company, Surry.
Holm, Hans H., Woodfords.
Lapham, E. A., Pittston.
Lombard, T. M., Auburn.
Lufkin, W. C., Rockland.
Merrill, A. L., Auburn.
Merrill, Chas. A., Auburn.
Merrill, Mrs. J. H., Auburn.
Mt. Desert Nursery Co., Bar Harbor.
Penney, C. A., Hancock.
Perkins, C. S., Vassalboro.
Phillips, W. H., Hancock.
Smith, Chas., Thorndike.
Soule, Malcolm, Freeport.
Woodman, H. M., Auburn.
Wooster, E. W., Washington Jct.

Ornamental.

Elm Brook Farm Co., Augusta.
Hussey, J. C., Oakland.
McCabe Brothers, Bangor.
Mitchell & Company, Waterville.
Mt. Desert Nursery Co., Bar Harbor.
Roak, Geo. M.. Auburn.
Wiles, Z. F., Gardiner.



Acaspis Rosae on Brambles.

Fruit Trees.

Hancock Nursery Co., Surry. Mitchell & Company, Waterville.

Evergreens.

Casco Bay Nursery Co., Yarmouth. Jackson, H. A., Westbrook.
Mahoney, Geo., Saco.

Ginseng.

Hoyt, Wm., Dexter.

NURSERY AGENTS AND LICENSES.

The laws relating to nursery agents were changed by the legislature of 1911 so that now the agent is required to give a fee of ten dollars in order to sell stock in the State. As a result, the number of agents licensed since July, 1911, has greatly decreased and only about fifty are listed in the office. Many nurserymen outside of the State have told their agents that the law is unconstitutional and cannot be enforced and not to pay attention to it.

The following is a list of states that have a fee or bond law:

STATES THAT HAVE A LICENSE FEE.

Florida		$25 00				
Idaho	Bond of	1,000 00				
Michigan	" "	1,000 00	Must be filed		Fee	$5 00
Montana	" "	1,000 00			"	25 00
Oklahoma		5 00				
Texas		5 00				
Utah		2 50	Bond of	$500 00		
Virginia		20 00				
Washington		5 00	Bond of	1,000 00		
West Virginia	Has license fee.					
Wisconsin		10 00				
Wyoming		25 00	Bond of	500 00		

As yet a test case has not been made owing to the necessity of work along other lines but I believe the matter should be taken up at once and settled, not only because of illegal selling but also as a matter of justice to the men who have already paid their fees.

A number of complaints have been sent in from various localities of stock being sold by agents without a license and such work must be stopped.

The following list comprises the agents licensed during the season:

LIST OF NURSERY AGENTS LICENSED BY THE STATE ENTOMOLOGIST FROM JANUARY 1 TO JULY 1, 1911.

Adams, Tracy Lee.....E. Denmark
Anderson, A. H..... New Sweden
Atkins, A. W.....W. Peru
Atwood, W. H.....Lisbon
Bacon, Carlton H.....No. Paris
Barrett, Arthur P.....Topsham
Bartlett, Geo. A..... Blanchard
Bean, Gardiner L.....Bingham
Beane, Halburt C.....No. Dexter
Beck, E. L..... Livermore Falls
Booker, A. W..... Lisbon Falls
Bucknam, N. D..... Yarmouth
Candage, Herbert A..... So. Bluehill
Chadbourne, Chas. L..... No. Bridgton
Chase, Homer N..... Auburn
Chase, Thomas E..... Auburn
Chellis, Harold A.....Newfield
Churchill, Mark W..... Washburn
Clark, Dana L..... Oakland
Clark, Fred L..... New Sharon
Cobb, Willard ..... West Paris
Collins, Karl R.....West Gardiner
Cousins, Everett E..... Guilford
Crockett, L. O..... Camden
Cummings, M. E.....So. Windham
Dakin, E. J..... Wilton
Davis, A. C..... So. Paris
Eaton, S. H..... Oxford
Edgecomb, Chas. R..... Acton
Emerson, C. L..... Turner
Fall, G. W..... Garland
Farrar, Roydon F..... Newport
Fox, A. N.....So. Berwick
Gerald, Llewellyn ..... Albion
Gove, G. W..... Dexter
Greene, L. H..... Houlton
Haines, Robert..... Smyrna Mills
Hale, Herbert H.....So. Bluehill
Hall, Frank A..... Limington
Hall, W. R..... Newport
Harrington, Ernest A..... Gt. Chebeague
Heath, Clayton N.....Fryeburg
Henderson, Wm..... Stillwater
Heywood, Roscoe..... No. Vassalboro
Hilyard, C. S..... Linneus
Hobbs, J. C..... Turner
Hodgdon, C. O..... E. Boothbay
Horne, Pierce A..... Wolfeboro, N. H.
Hyde, E. C.....Freeport
Jackson, Leander.....Yarmouth
Jordan, J. A.....Wellington
Jordan, J. M.....Auburn
Kimball, G. E..... Pittsfield
Knight, Carl E..... Pownal
Knowlton, Chester D.....Monroe
LaBree, Mrs. Della..... Monson
LaBree, F. H..... Monson
Lee, Zina B..... Patten
London, Geo. W..... Bangor
Lord, C. G..... So. Warren
Lovejoy, E. G.....Medford
Lowell, G. B.....Lee
Madden, R. L.....Windsor
Maxfield, F. H.....Greenwood
Maxwell, Ethan L..... Pittsfield
McAllister, Chester S.....Oxford
Mitchell, F. H..... Waterville
Nash, A. D..... Damariscotta
Newcomb, B. E.....Hollis
Norton, A. L.....New Portland
Noyes, W. H..... Prentiss
Page, Anson W..... Brownville
Parent, Harry..... .....Burnham
Philbrick, Geo. W..... Skowhegan
Pierce, Elmer E..... Mars Hill
Reynolds, Geo. L.....Graniteville, Vt.
Richardson, E. E.....W. Paris
Rogers, Fred A..... Newburg
Rollins, E. P..... Warren
Simmons, Elmer E.....Spruce Head

Small, John E..... Stonington
Smith, Albert H..... Bangor
Smith, Alfred J..... Gardiner
Smith, Isaac T..... Strong
Spaulding, Ambrose P.....Skowhegan
Stanley, John, Jr.....So. Hiram
Stinson, Arthur P..... Woolwich
Sullivan, D. Y..... Clinton
Sweetsir, A. D.....Pownal
Thompson, A. F..... Livermore
Thornton, F. C.....Brookton
Tucker, Sumner E.....So. Paris
Urguhart, Geo. R..... Vinalhaven
Waning, John M.....Unity
Ward, Matthias E..... Presque Isle
Wheeler, C. W..... Houlton
White, A. K..... Portland
Whitney, Walter S..... Cornish
Wilbur, Geo. F.....St. Albans
Willard, Albert ..... Levant
Williams, Fairfield..... Athens
Witham, Geo. D. B..... Gorham
Wright, Charles E..... Hartland
Wright, F. W..... Wilton
Wyman, Eugene F..... Winslow

LIST OF NURSERY AGENTS LICENSED BY THE STATE HORTICULTURIST FROM JULY, 1 1911 TO DECEMBER 31, 1911

IN ACCORDANCE WITH CHAPTER 15, SECTION 6, PUBLIC LAWS OF 1907, AS AMENDED BY CHAP. 34, PUBLIC LAWS of 1909 AND CHAPS. 84, AND 176, PUBLIC LAWS OF 1911.

Atwood, W. H..... Lisbon
Bolton, F. O..... Portland
Bowie, G. A..... New Gloucester
Cannon, S. T.....Augusta
Cole, J. E.....Union
Daggett, Lee.....Strong
Dakin, Ed J.....Wilton
Davis, A. C..... So. Paris
Dearborn, D. P..... Dexter
Dudley, F. H..... Auburn
Earl, C. H..... Litchfield
Eaton, Samuel H.....Oxford
Ellingwood, A. P.....Monroe
Farnham, Mark..... Wells
Fowler, W. B.....Monmouth
Fox, A. N..... So. Berwick
Gay, W. R.....Gardiner
Gould, R. D.....So. Paris
Gove, G. W.....Dexter
Green, Melvin A..... Parkman
Hersey, G. L.....E. Corinth
Hobbs, J. C..... Turner
Huntress, Sarah L.....So. Berwick
Kimball, Geo. E.....Pittsfield
Littlefield, S. L..... Poland
McCabe, Geo. L..... Bangor
McCabe, John C..... Bangor
Merrick, W. S..... Unity
Merrill, A. J.....Bangor
Miller, Geo. D.....Pembroke
Norton, A. D..... Farmington
Patten, L. P..... Hermon
Phillips, W. H..... Hancock Pt.
Prescott, Emery ..... Etna
Purinton, W. S..... Augusta
Purrington, James ..... North Berwick
Reynolds, Geo. L..... Graniteville, Vt.
Roberts, James A..... Waterboro
Sherman, Chester E..... Whitefield
Small, Ernest B.....Lisbon Falls
Small, Fred A.....Searsport
Smith, Alfred J.....Gardiner
Spaulding, Geo. L.....Orono
Sullivan, D. Y.....Clinton
White, Albert K.....Portland
Wiggin, C. S..... Waterford
Williams, Fairfield..... Athens
Wood, E. L.....Unity
Woodman, F. D..... Winterport
Wright, F. W.....Wilton

EXHIBITS AT FAIRS.

This year the state exhibit of insects was displayed at the state fairs,—Eastern Maine State Fair at Bangor, Central Maine Fair at Waterville and Maine State Fair at Lewiston; at the Franklin County Fair at Farmington and at the North Ellsworth Fair.

In addition to the usual exhibit of insects, various diseases of the fruit tree, including canker in different forms, crown gall, woolly aphis, black and brown knot and various scale infestations; and the spray materials, Bordeaux mixture, commercial and home-made lime-sulphur, tobacco infusion and kerosene emulsion were added.

These additions proved as interesting and valuable as the rest of the exhibit and questions were continually asked concerning them.

More profit can be received from these exhibits than from any other source of information and it would seem that a greater number of exhibitions at fairs and elsewhere would go far in teaching the dangers of, and remedies for, the pests that are so destructive at present.

In connection with the fairs, I believe we would profit better by devoting the time spent at many of the small local fairs, in giving demonstration in box packing of fruit, particularly apples. Many requests were sent in by growers for demonstrations on their orchards, and we were obliged to refuse, owing to the fair inspection. Little real profit resulted from these inspections as far as the work of the Department is concerned; inasmuch as it was hard to locate the growers and create any enthusiasm in the fruit work.

Box packing is becoming more and more popular and the number of men available to the growers, as demonstrators, are limited; so it would seem that more time should be devoted to this line of work. Demonstrations of this kind could be given at the large fairs at stated hours without any inconvenience and doubtless would arouse much interest.

During the year we have spoken before fourteen granges, forty institutes, two fruit growers' associations and forty-nine demonstration meetings.

The latter work has been the most productive of results and much greater good has been accomplished in the orchard itself than on the platform. Actual existing conditions are what interests the grower, particularly his own, and if you can help with his particular problems in a practicable way, you can create greater interest in the work.

The work of the Department has been shared about equally between Mr. Yeaton and myself and I wish to acknowledge at this time, the able assistance that he has given in the work.

Respectfully submitted,

ALBERT K. GARDNER, *State Horticulturist.*

REPORT OF FIELD AGENT, GYPSY MOTH WORK.

To the Honorable J. P. Buckley, Commissioner of Agriculture:

I herewith submit a report of my work as Field Agent of the Gypsy moth work for the year 1911.

One year ago, Jan. 1st, 1911, the following towns were infested with the Gypsy moth, thirty in number:

Kittery, York, Wells, Eliot, South Berwick, Berwick, North Berwick, Lebanon, Sanford, Alfred, Acton, Shapleigh, Newfield, Waterboro, Lyman, Kennebunk, Kennebunkport, Dayton, Buxton, Saco, Biddeford, Old Orchard, Scarboro, Parsonsfield, Standish, Gorham, Westbrook, Portland, South Portland and Cape Elizabeth.

During the year just past the following additional towns have been found to be infested:

Hollis, Limerick, Cornish, Limington, Windham, Durham, Brunswick, Lisbon, Auburn, Topsham, Harpswell, Phippsburg, Bath, Woolwich, Georgetown, Bowdoinham, Lewiston, Richmond, New Gloucester, Westport, Newcastle, Whitefield, Damariscotta, Wiscasset, Bowdoin, Dresden, Alna, Arrowsic, Gardiner, Pittston, Falmouth, Cumberland, Yarmouth, North Yarmouth, Pownal and Freeport.

The total number of infested towns Jan. 1, 1912, is sixty-six. This large increase of infested territory does not mean that the moth has spread over this area in one year. The fact that we have received more assistance from the United States government than ever before has made it possible to keep a large force of men in the field and an accordingly larger extent of territory has been inspected. This large increase of territory, however, presents to the State a more serious problem than ever before and unless good work can be continued the Gypsy moth will obtain a foothold in the interior of our State and will be beyond our control.

Burlapping Trees in Gypsy Moth Work.

The infested territory may be divided into two districts, each one presenting a different problem and requiring a different method of solution. One district comprises all those towns outside of York county with the exception of a few in Cumberland county. In these towns the moth does not occur in large enough numbers to threaten immediate damage to tree growth and it seems probable that if an annual inspection can be made real danger can be averted for several years. If from lack of funds it is impossible to make this annual inspection, many forests will be threatened with destruction. This part of the territory has been handled and will during the coming year be handled by the government forces.

The other district includes the towns in York county and a few in Cumberland county. In this section lies the danger of early devastation by the Gypsy moth and to prevent this requires not only the annual scouting operations but also the supplementary summer work of burlapping and spraying. Only by these methods will it be possible to hold the moth in check for a period of years. With the present funds at the disposal of this department for the Gypsy moth work, it is impossible to carry on the much-needed summer work to a sufficient degree without neglecting the scouting operations which are of primary importance. Accordingly, whereas scouting and destroying egg clusters will prevent devastation for a few years, further work is necessary to minimize the danger in this badly infested area.

This natural division of the infested territory has resulted in a co-operation with the United States government forces whereby the latter are carrying on the work in the slightly infested towns on the border while the state forces are working almost entirely in York county endeavoring to so reduce the numbers of the Gypsy moth that actual devastation of trees may be prevented.

THE YEAR'S WORK.

The field work of suppression was begun in 1911 on May 1st. Realizing the enormous extent of territory to be scouted during the fall of 1911, it did not seem advisable to use much money in the expensive summer operations. Accordingly, in a limited way, burlapping was carried on in the towns along the northern

border of the infested area in an effort to check if possible further spread of the moth into the interior of the State. Approximately 60,000 trees were burlapped and inspected daily during the caterpillar season. The towns burlapped by the state force were:

Parsonsfield, Newfield, Shapleigh, Acton, Limerick, Windham, Westbrook, Portland and South Portland.

All the other border towns as far east as Bowdoinham and Georgetown were burlapped and handled by the government forces. It is too early now to learn the results of the summer work, although it seems probable that the northern border has been located and that further spread in that direction can be prevented. During the summer practically all of the known infestations in the border towns were stamped out.

The average number of men per month kept in the field by this department during the summer was twenty; by the U. S. government, forty.

Active field operations were discontinued from the middle of August to Sept. 5th. At that time the regular fall scout was begun in the towns of Kittery and Eliot and this work has been continued throughout the year with especially gratifying results. Weather conditions have been ideal for scouting and a large extent of territory has been covered. Considerable work has been done in the large woodland infestations of York, Kittery, Wells and South Berwick where thousands of egg clusters were threatening the destruction of hundreds of acres of woodlands and at a minimum of cost this danger has been averted for at least another year. Approximately 100,000 egg clusters have been destroyed during the past four months. It is useless to try to estimate the number of caterpillars that would have hatched from these eggs had the work not been done but it is the opinion of the Field Agent that if these egg clusters had been left untouched, large sections of woodland would have been wholly devastated during the summer of 1912.

In this connection it should be realized that whereas scouting is probably more effective and economical than any other one method of combatting the Gypsy moth, it will not in the long run control the pest to such a degree as to prevent devastation. To do this successfully scouting must be followed by summer operations, i. e., burlapping and spraying. At present the funds

at the disposal of this department for the Gypsy moth work permit summer work only in a limited measure.

The following is a list of the towns scouted during the fall of 1911 and the number of egg clusters destroyed in each town:

York	30,096	Scarboro	488
Eliot	16,176	*Kennebunk	399
Kittery	15,384	Acton	315
*Wells	13,338	*Sanford	271
South Berwick	9,598	South Portland	118
Berwick	4,031	Westbrook	111
North Berwick	3,790	*Dayton	109
Lebanon	2,129	Cape Elizabeth	27
Kennebunkport	1,449		

* Unfinished January 1st, 1912.

The average number of men per month employed by this department during the scouting period was twenty-five.

Since Oct. 15th the government forces have been working on the eastern border of the infested territory. About forty men have been kept in the field in that section.

It has been noted during the past year that the people of this State are beginning to realize more fully the vital importance of this Gypsy moth problem in relation to the preservation of their orchards and shade trees. This has become evident from the letters that have been received by this department and even more by the fact that more and more spraying is being done by the owners of orchards. This is especially true in the southern towns of York county. Extensive spraying in those towns has kept many orchards entirely free from the Gypsy moth and has supplemented the state work in a large degree.

PARASITE SITUATION IN MAINE.

During the past year it has been noted by the Field Agent that several of the bad woodland colonies where no work was done during the previous year, do not show the usual increase in numbers of the moth. In these particular woodlands, it seems evident that natural enemies (parasites) or disease may have held the Gypsy moth in check although in other woodland infestations no such encouraging conditions were found. This is an extremely important matter and the United States Laboratory at Melrose, Massachusetts, is conducting a series of experiments in Maine with the view of ascertaining what natural causes, if any, are seemingly checking the pest in certain of the infested woodlands. An effort is also being made to deter-

mine more specifically just what trees are sufficiently resistant to the attack of the Gypsy moth larvæ to be safe from damage. In other words, it is desired to learn if possible just what trees should be removed from a woodland and what trees left on the same woodland to render it safe from this pest. The importance of these cannot be over-estimated since it must be realized that the only eventual relief from the tremendous danger of the Gypsy moth can be afforded by the action of parasites and disease.

Foreign parasites have been imported to this country in great numbers by the United States authorities and many of these have been liberated in the infested woodlands. It has been noted that several of the species liberated have survived the winter months and that favorable results have been attained in certain sections. No general results can be looked for, however, until the parasites become generally established over the infested territory.

Any encouragement that can be gained from the parasite situation does not mean that we should cease our present methods of checking the pest. In all probability the Gypsy moth will always be a source of more or less danger to the forests of this State and increased efforts should be made during the next few years to minimize the danger which threatens our tree growth. The encouraging features of the parasite situation should be an encouragement to continue the work of suppression rather than an excuse to drop it. The work already done by the State of Maine has saved the State many times the amount it has cost and there is yet time for the Gypsy moth to do untold damage before the parasites become well established over all of the infested area.

CONCLUSION.

The most discouraging feature of the moth situation in Maine is the enormous increase of infested territory. As has been shown in this report, the area has more than doubled during the past year and the seriousness of the situation can no longer be doubted. We are, however, receiving more assistance from the United States government forces than previously and it seems likely that this will continue even in an increased measure during the coming year. Practically all of the govern-

ment work has been done in the slightly infested border towns in an effort to hold the moth in check in those towns as well as to prevent any further spread into the interior of the State. For the spirit of co-operation which has existed between the state and government forces during the past year and for a great deal of advice and assistance, Mr. D. M. Rogers, Superintendent of the United States Gypsy moth work of New England, is entitled to the deep gratitude of the department. Without this co-operation, the efficiency of our work would have been greatly lessened.

In relation to the badly infested towns of York and Cumberland Counties, it should be realized that whereas a great deal of work has been done and good results obtained, it remains a fact that the work is handicapped by lack of sufficient funds to cover the whole area of infested woodlands. A grain of encouragement is afforded by the parasites but at best this applies to a very small portion of the infested territory and another year may show a large increase of the pest in those very sections where this year there seem to have been favorable results.

The following facts should be fully realized:

Heretofore there has been no devastation of trees in Maine because effective work has been done during the present and previous years. Work was taken up in Maine before the pest gained as strong a foothold as was the case in New Hampshire and Massachusetts and it was therefore possible to prevent devastation. But for all that there are now many sections in York County where work will be necessary for many years yet, if actual damage is to be prevented. In fact, unless the work of suppression is carried on extensively over all the infested territory, the forests of Maine will be in danger of devastation and moreover all the money heretofore expended in this work will have been wasted.

Since taking charge of the Gypsy moth work, I have endeavored to place the work on a business-like basis and I wish to express my gratitude to the foremen who have worked honestly and faithfully to bring this about. I take pleasure also in assuring you that I appreciate the consideration and co-operation with which you have favored me during the past year.

Respectfully submitted,

A. O. PIKE, *Field Agent.*

REPORT OF LIVE STOCK SANITARY COMMISSIONER.

To Hon. J. P. Buckley, Commissioner of Agriculture:

I herewith respectfully submit my report as Live Stock Sanitary Commissioner, from May 1st to December 31st, 1911.

Since May 1st, 1911, when I took up my duties as Live Stock Sanitary Commissioner, I have found that among the cattle where the tuberculin test has been applied year after year there is a very small percentage of tuberculosis found; but in the sections where the test has not been carried out, there is found a very large percentage of tuberculous cattle. Most of the farmers and breeders are taking up the testing of their herds. The law requires that all cattle coming into the State shall be tested within 30 days of arrival, regardless of all other tests; and that all pure bred cattle that are to be transferred from one part of the State to another, and cattle exhibited at the fairs, for dairying and breeding purposes, where the State gives aid, must be tested with tuberculin within one year of the time of the exhibition. This is of great assistance in stamping out tuberculosis among the cattle of this State. The cities of Portland and Waterville require that all the milk supply be delivered from cows that have been tested within a year, and many of the creameries in the State pay one cent more per pound for butter fat from cows that are tested than from cows that are not tested.

Our State is doing more to stamp out disease among animals than any other State in the Union; and it will be of splendid assistance to the owners of cattle in the State and will put Maine in the front rank, for animals that are free from tuberculosis, as well as other contagious and infectious diseases. The new law requires that horses being brought into the State shall

be tested with mallein to learn whether they are glandered or not, and this is of great assistance to the owners of horses and the State.

FINANCIAL STATEMENT.

May 1 to December 31, 1911.

Appropriation for 1911	$25,000 00	
Received from the sale of hides and carcasses	1,486 00	$26,486 18
Paid for condemned animals	$18,179 60	
Salary and expenses of Live Stock Sanitary Commissioner	1,755 37	
Services and expenses of Assistants	473 17	
Clerical work	253 00	
Printing and binding	84 87	
Hog cholera serum	115 00	
Other supplies and incidental expenses	444 95	
Express, telephone and telegraph	110 23	21,416 19
		$5,069 99

The number of animals condemned and destroyed during this time, amount paid for same and average amount per animal, are as follows:

	No.	Amount.	Amount per animal.
Pure bred cattle condemned for tuberculosis	9	$800 00	$88 88
Grade cattle condemned for tuberculosis	322	12,281 50	38 14
Cattle killed for beef and found diseased with tuberculosis	27	734 10	27 19
Cows condemned with lump jaw	4	120 00	30 00
Pure bred cattle killed at Brighton, diseased with tuberculosis	3	159 20	53 07
Grade cattle killed at Brighton, diseased with tuberculosis	93	2,885 80	31 03
Total number of cattle killed at Brighton, 96; total appraisals, $4,325.00; amount received for hides and carcasses, $1,280.00.			
Horses condemned with glanders	29	999 00	34 45
Horses condemned with cerebro-spinal meningitis	4	200 00	50 00
	491	$18,179 60	$37 02

VAN W. CARLL,

Live Stock Sanitary Commissioner.

INSTITUTE PAPERS.

COST OF MILK AND BUTTER PRODUCTION AND THE MARKETING OF THESE PRODUCTS.

By Prof. J. W. Sanborn, Gilmanton, N. H.

The subject assigned me by your worthy Commissioner is of more importance than appears on the face of it. Not until we know clearly the real cost of our products can we fix with intelligence the price that we should receive. The problem of cost of milk is made more complex and therefore its cost made more vague than is necessary. Into the problem is woven the cost of crop production and of raising the cow and other costs that should be dissevered from it. The primary business of farming is that of crop production, and the profits of the business should be measured by crops. The cow is a sort of collateral business. She exists on the farm for the purpose of marketing crops in more concentrated form and for the production of plant food. She is a home market for the direct sales of farm crops. The cow as a market for crops should never be used when a better market is at command. It will be seen that I expect the cow to pay full market price for all the food consumed. All her products should be credited to her account at their full value. This will include of course the manure and calves produced. There are those who reason that the cow must be kept in order to produce plant food for the preservation of farm fertility, whether she pays for the foods and care given or not. This position is unsound. It is based upon the proposition that the milk producer must sell to the cow food at less than the world sells it in open market and finds that essential to the success of agriculture. If it is replied that there is no better animal source of plant food and that fertility cannot

be kept up by other than animal life on the farm, while I might demur at this conclusion yet accepting it for convenience would reply that our industry is subject to the great laws of economics. If production outruns consumption so far as to make it unremunerative, persons enough must leave it until an equilibrium of profit compared with other industries is reached. This I am aware is treason from the usual point of view. It is, however, in consonance with common sense and the great law that governs industrial evolution and that is now governing ours, in spite of several great opposing forces. The past ten census years show a growth of 21 per cent in the population of the nation, 15 per cent increase of arable area and but 4 per cent of area in farms. It is well known the nation over, farm population fails to keep up with other population. Farm prices have increased in the last decade, according to Secretary Wilson, 54 per cent faster than the average of prices for other commodities listed in arriving at price movements. By a great law we are rapidly moving forward to a basis upon which we can adjust our farm operations upon the proper financial basis, that of fair profit for each operation.

On the other hand, there are those that assume that the cow should yield a profit on the foods used above those of the market price. It may be desirable and pleasant to secure this result. But it is clear that when the cow has paid for all costs in every form that enter into her products she should become our market for farm crops unless indeed it can be shown that some other animal is a better market for them.

What are the costs that enter into butter and milk production? I shall dwell upon them because I believe that the problem should be considered from a somewhat new and certainly more critical point of view.

First, I want to press the point that the farmer should expect a revenue from his business that gives him as complete living in all its aspects as the age affords other workers using the same amount of capital, labor and professional skill. Space forbids other than crisp dogmatic assertion. His business is the most important to the race, he lives in greater isolation from modern privileges of many kinds, his work is hard, his capital is subject to more vicissitudes, while he now is facing the necessity of professional skill of the very highest order. Society should pay him well.

Second, his privileges should embrace as short hours of labor as prevail for the times. He now averages fully 25 per cent more time at labor than industrialists average. If now nine hours per day is the average time of others it should be his. This time, too, should include such chores as become necessary in prosecuting his business. Why not? Can mortal tell?

My propositions and others immediately following in this connection are for the purpose not only of getting at fair values in milk production but to aid in creating a sentiment that shall end in a new and modern point of view as to the relation of farmers to public life from a public point of view. Farmers tell me that they could not make the farm pay in case they should work but 10 hours per day. But do they not know that if as a body they adopted the short day now prevailing and cut three hours from their average day's labor they would almost immediately get more for a nine hours or nearer ten hours day than they now get for 12 to 13 hours work? Production would be reduced and prices would rise. However, it might turn out that 10 hours in the work harness and the keener thinking that would follow more energy left over for thinking in the short day would result in approximately the same production in the process of moderate time. Let us prepare for shorter hours, and the demand for the world's pay for short hours.

Third, let us expect the same pay as the world gets for labor. The carpenters of some of our cities get 50 cents per hour for designedly languid work and work but 8 hours. The farmer works, chores and all, 12 to 15 hours and receives but 14 cents per hour for only ten of the longer hours he puts in. We, too, must come to think of ourselves as professional men and expect the pay of professional men. Our industry involves a far wider knowledge of the reign of law in a far wider domain of the sciences than any other industry and demands keener observation accompanied with the use of both the executive and mercantile talents. It is evident that the wealth producer does not get for his services what those secondary classes that deal in his production and handle his general interests do. This condition by every law of fitness should be reversed.

Fourth, farm capital should have the same reward for its use or even greater reward than most other capital. It is a prey to losses in droughts, frosts, storms, insects, taxes and other forces that he cannot control. Yet the world does not expect the farm to pay over three or four per cent on the investment.

Fifth, farm buildings and all farm improvements directed to the care of the cows should be estimated in the cost of milk production to as full a degree as such items are in the production of a yard of cloth. Every cost should be estimated to the full. The dairyman has never so done in respect to hours of labor and real value of his labor, nor has he estimated the capital in buildings and their care, interest and risk on cows, &c., &c., as is done below. That we as a class have failed to properly estimate cost and have failed to secure adequate profits is in evidence by the constantly decreasing ratio of farmers, by the failure of our boys to accept as a gift their fathers' farms when accompanied by the necessity of remaining on them.

To many the above expressions will seem out of place, pessimistic, and the words of a mere agitator. In long service for the public as an exponent of farm problems I have not given expression to similar views. I do so now with the belief that it is better for us to face real costs as they fairly are, since otherwise we certainly will not be prepared to exact the price we should, nor will the public, accustomed to other conditions, cease to cry out against the high price of food products, a complaint now especially aimed at butter and milk.

In estimating the costs of keeping a cow per year below, I, too, have refrained from applying fully the principles laid down above, as we are not yet ready to accept any estimate based on the short day and longer pay, yet including something for managerial service. My hearers are many of them aware that I devoted 18 years of time to a long array of nutrition investigations at the colleges of three states and that I am now, as I was before entering upon that work, engaged heavily in farming. I have a very large herd. My data are then based upon a background of large experience and thousands of weighings of food. They are intended to be as accurate and fair as I can well make them. The total will surprise and repel most farmers at first sight. I invite a close scrutiny and criticism of every figure.

Hay is estimated at its market value at my farm less a dollar per ton, for some foods are fed that are below the market value and some are injured in the harvesting. The grain is rated at what is esteemed the average of a series of years but below present values. The barn shelter is on the basis of the cost of a new barn used by me and may be too high in the estimation of some who would reduce the cost by a dollar or so per annum. I am at about the middle zone from Boston and 4 1-2 miles from the depot and represent about the average distance from the station, and cost for delivery, as does the price of milk quoted, stands for the average price. I have from data taken in my own herd assumed that the cost of feed given in the table fairly represents the amount required for cows yielding 6000 pounds of milk a year, for a large herd.

Hay and coarse food for winter	$30 00
Hay and coarse food for summer	9 99
One pound grain for each three pounds of milk given, at $28 per ton	28 00
Pasturage	5 00
Care of cows each	9 00
Interest on shelter, and repairs	5 00
Interest and risk on cow @ $60	6 00
Depreciation of cow	6 00
Milking	10 00
Salt, medicine, veterinarian and tools	1 50
Delivery milk to depot 4 1-2 miles per cow	7 00
Managerial service	5 00
Bedding	3 50
Tags, Association fee, correspondence, and miscellaneous items	50
Cost of male	1 00
	$127 49
By 6,000 pounds milk at 30 3-4 cents per can	$99 82
2 1-2 tons manure to ton food at $1.50 ton	18 75
calf	2 50
loss	6 42
	$127 49

This shows a loss at rates prevailing at my farm 85 miles out from Boston, 4 1-2 miles from a railroad and 15 miles from market.

At the rates for milk prevailing the year previous a balance of $1.40 was shown on the right side. The past year the milk

market has been demoralized in Boston. I look for the price to return until both sides about fairly meet.

It will be noted that the cost of milk was just about 3.81 cents per quart. This is found by deducting the credit for calf and manure from the cost and dividing the net cost by the quarts of milk produced. Below this rate milk cannot be made under the average conditions prevalent in New England. Indeed four cents roundly may be assumed to be a fair cost.

In some sections it cannot be produced for this. Indeed, about our great centers the increased cost would be material. I am not a butter producer at present and can speak only in the light of past experience. I do not claim in the following data to be exact but very closely so. The cows in question should show 4% fat. This would average 240 lbs. butter fat per cow and at 16% water in the butter would mean 284 1-2 pounds of butter. The cost of making, including packages, is very closely the same as the delivery of the milk to the station in the case of milk sales. From the total cost of keeping the cows must be deducted the credits aside from butter. To the credits already given in the case of butter must be added the value of the skim-milk. This at 22 cents per 100 lbs. would be $12.57, making a total credit aside from butter of $33.82. This taken from the total cost of keeping the cow leaves a balance of $93.67 as the cost of 284 1-2 lbs. butter or 33 cents per pound. If the matter is traced further it will be found at the rates paid for milk in Boston during the past year that butter making from cows whose milk is rich in fat is as profitable as milk production from ordinary cows. This factor requires some nice calculations and compilation of results derived from the cost of butter production from Jersey and Guernsey cows compared to milk production from the milking line of cows. But the data are sufficiently clear in my mind to warrant the above statement based on rates for milk and butter for the past year in Boston. There has been a constantly falling away of milk producers from the Boston market. There is no doubt a general dissatisfaction on the part of producers with the milk market. The calculations above made not for the purpose of proving a position but for the elucidation of it seem to justify the general views prevailing as to the profits of the business of milk production.

MARKETING DAIRY PRODUCTS.

I am either too well or too poorly informed to discuss this matter to your satisfaction or for that matter to my own. Your Commissioner desires to find some way of reaching the consumer at less cost for the exchange than now prevails or to put it in the form now expressed, he wants to know how the producer can get more of the dollar that the consumer is forced to pay for the farmer's products, especially those of the dairy. The milk that I am selling for 4 cents per quart, for the production of which I have devoted a farm and all its capitalization for one year—for we can get but one crop per year—representing wealth that I have created, is sold the next day, merely being passed from my hand to the consumer, for 9 cents and I get but 44 cents on the dollar of the sale. This problem of distribution or exchange of wealth is as old as organized industries and has vexed the earth for many centuries. It is as yet an unsolved problem. This shows that the middleman, so-called, is a necessity, or at least, a very great convenience. The producer cannot very well distribute his goods over many and distant markets. Exchange agents in some form and under some name, it matters not what name, must aid in distribution of goods to the consumer. He may be our agent, or in other words, we may sell co-operatively. Attempts at co-operation in all forms are hoary with age. Why has not their success been universal? Because indirect interest is never as effective as direct interest. The man who acts on his own initiative directly for himself works more tensely, buys more keenly, sells more prudently, takes care of credits more sharply, sees that wastage is reduced to the minimum and that all, to the very best of his ability, is done at its best. Thus far in the world's history the saving by agents of co-operative organizations has not as a whole been equal to the superior efficiency of the man who has the closest personal interest, namely the one who has his cash and his fate involved. Again, agents lack the inherent quality of self reliant men who act for themselves. Too often they are indifferent. Those who are efficient to a very high degree command more pay than cooperative associations are willing to give. The very fact of higher reward than the average is the one thing that cooperators desire to es-

cape. There are probably a hundred tombstones marking the death of cooperative enterprises to one monument to their success. In this country their mortality has been especially complete, yet I am glad to say of late not wholly so. The grange, organized with cooperation prominent in its purposes, has mourned the loss of thousands of efforts. Other organizations that have run into the hundreds of thousands of members, and one or more into the millions, for the purpose of joint effort, have gone to rest. The Wheel, the Alliance, the Sons of Equity, and several other great western farm organizations, some of which I knew of personally, are among them. Grange and other stores have risen in the East, but mostly to disappear. A few are living, notably the one at Houlton, and apparently successfully. Each New England state has tried by its granges to do exchange business for their orders. The effort was early made and failed. Recently it has been tried again in four of these New England states but not successfully.

In Europe there are 90,000 co-operative organizations, covering most fields of endeavor and all phases of farm affairs. It appears from the volume of information at my command that co-operation after many failures is now safely on the road to success there. Their review would be tedious. Sufficient will be one illustration. In butter, eggs and pork products the Danish farm co-operators sell over $17,000,000 dollars worth to one cooperative purchasing organization in England. This English purchasing agency deals in the hundreds of millions annually. Though it began with some dozen weavers, it has grown to two and one-half millions in membership. Failure in this country has been due to our larger farms, to the independence of the American farmer, suspicion of others and the feeling of adequacy to handle his own affairs. The recent world-wide agitation of the cost of living, especially as related to farm products, has brought out into clear relief the fact that it is not the farmer that creates these costs but the exchanger. The 35 per cent only of the consumer's dollar that reaches the farmer's pocket has set our farmers to thinking and is moving them to action. Before this period, however, the exactions of the railroads and of the middlemen had driven the citrus fruit growers of California to successful cooperative exchange. The same fact has acted likewise in fruit growing sections of Oregon and

Idaho, in Florida and among the truck and small fruit growers of the South Atlantic coast.

Just now there is great fumbling around in search of the successful method of bringing the consumer and producer closer together. Secretary Wilson's suggestion that city purchasing clubs be formed to buy direct of the producer is being acted upon in an experimental way. Mayor Shank's plan of buying potatoes for Indianapolis in his individual capacity is only what German cities are doing in their corporate capacity,—selling to the poor at cost. Responsible producing clubs, organized say by the grange or by responsible bodies, who arrange for suitable grading of products, should deal direct with responsible purchasing clubs of our cities. This seems to be at present the most hopeful plan. The committee on co-operation of the New Hampshire State Grange is proposing to raise an ample capital to buy direct of manufacturers, importers and wholesalers. It is hoped to deal directly with an agent of each subordinate grange. Such an agent can collect the orders on grange evenings and distribute goods arriving, without the cost of the machinery that must be purposely organized by the trade. A state grange obviously can handle millions yearly without the costs of the equipment of the trade. In fact, the equipment is practically at hand and the trade also assured if initial success can be secured. Efforts in this direction have failed heretofore from lack of capital and the indisposition to pay fair salaries to agents. We face the possibility of failure in New Hampshire on this ground.

This may seem discursive and an avoidance of the task assigned me, to set forth some method of reaching more directly the consumer of dairy products. But the general data hurriedly and very imperfectly covered embrace the difficulties to be met in handling these products in part and only in part.

City people now demand that goods be delivered to their homes by the pound. Commission merchants handle butter for from one to two cents per pound. Can we get butter to the consumer cheaper than by present methods? I do not see a heavy margin of gain by any other method unless by direct shipment from the country to a consumers' club in such quantity as to secure low rates in transportation. The parcel post to come will not help us to economy in this direction, as its rates are too high.

The milk problem is the most complex one of all farm products. Sixty cents of the producer's money out of each dollar that the consumer pays ought not to go into the hands of the railroads and the dealers. A strong organization of the New England milk producers has for years been seeking a solution of the problem but is not nearer to it than years ago. It has affected the price paid by the contractors, but it has not affected the cost of exchange. The contractors have in the last decade greatly consolidated the handling of milk and perfected their methods, yet the distance between the producer and the consumer has not been materially bridged. Nor does it appear that contractors though handling immense quantities of milk have become inordinately rich. Shipment to consumers' clubs would help here. But this means that the old-fashioned method of marketing must come into vogue again, if the cost of distribution is to be seriously reduced. Many of our American farm products are sold for less in European markets than in our own. But merchants are content with less margins while the good wife goes to the market far more fully than here. But the merchants lower tribute on goods is partly induced by the far wider spirit of co-operation than exists here.

I am aware that I have not helped you much, if any. This makes my discussion of the subject, though by request, peculiarly unsatisfactory to myself. In conclusion I may say that the fact that the middlemen get often the lion's share of the final selling price of the goods that we create and lead an easier and more luxurious life, is causing the whole problem to undergo a far more tense inquiry approaching to grim determination to close much of the chasm between the producer and the consumer. Both parties in interest are moving to one end. The producer will not remain content to work harder and longer, accept less for his services and live lower than those rendering less service to the race and giving services of a lower mental order. He is becoming alive to facts that environ and hedge him in. He will find at least a partial solution of the difficulty. One move that he will make is towards greater catholicism. He will sacrifice something of his indisposition to work heartily and fairly and without unjust suspicion wth his neighbors for the common good. He will place capital in the common treasury and be willing to pay for competent brains to handle the joint

affairs. The speaker believes that a period of education or of ripening of opinion must come before rash action or broad action can be taken. Your worthy Commissioner is taking a necessary step in thus placing the problem well to the front in his institute work.

I trust that it may not be regarded inappropriate for me to say that at my suggestion the New England Milk Producers' Company is to take a new and I believe advanced position in the effort to secure a voice in the price of their milk. It was voted at their meeting in Boston in January that a thoroughly competent man be secured and an adequate price be paid to insure such a man. One is to be sought who is at once an organizer and a diplomat. He is to be placed in an office in Boston. His work is to be to master the problem of transportation, to learn minutely the cost of distribution of milk in Boston, to arrange on amicable terms with the contractors of the milk supply in Boston, if possible, to secure a steady price by the year and to aid them in steadying the price for the city; also to acquaint the consumer with the fact that condensed milk contains far more bacteria than new and whole milk and sells for much more per pound of milk solids than whole milk, in short that it is a very inferior milk, and to invite attention to this fact from the Boston Board of Health, that has found so much fault with the milk supply and by broad denunciations of some milk, conveyed the impression to the consumer that all milk is filthy and likely to be diseased, thus playing into the hands of the condensed milk companies. The mayor and the press in the language of excitement have inculcated the same false belief. The press carries heavy advertisements of condensed milk. To counteract these influences and to reach the ear of the consumer is a difficult task but one that must be accomplished. The consumption of whole milk has heavily decreased in Boston and of condensed milk greatly increased under the onslaughts of the agencies named. This is abnormal to Boston, it not occurring elsewhere to the same degree. If Boston can be made to know the truth and milk consumption come back to its normal amount, and in keeping with the increased population of the city, there would be no surplus milk at fair rates left for the market. Then, too, the producers must be made somehow to feel that a dollar to the company is a far

more effective dollar than any they expend. A narrow view has been taken by many of their responsibility to themselves, for it is their affair, and of their duty to their neighbors in the matter. They expect the other fellow to pay and the thing to go on while they save their dollar. This spirit is one of the weaknesses of co-operation of a widely dispersed body of co-operators. This new move is to address itself to the individual factor, to create, in brief, the elemental condition here that secures success in European farmers' co-operative organizations. Co-operators must for a time break sod and till the ground, save where community interests in a narrow belt where a given product is very universally grown as in fruit, vegetable and potato growing sections that have to market at a distance, are concerned.

THE DAIRY COW.

By W. F. McSPARRAN.

I think I may write it down as a demonstrated truth that prosperity follows the dairy cow. In my rather extensive lecture work among farmers in various states of the Union and under varied conditions of methods of farming, climate and general farm environment, I should be qualified to speak intelligently upon the question of profitable farming, and I may repeat that good cows and well-doing are closely related.

Indeed I may go a step farther and say that speaking for farming in general, those farmers who are giving the most careful and intelligent attention to the dairy business are our most prosperous class of farmers. Their business is the most clearly defined, their methods the best systemized, their occupations the most uninterrupted and continuous, thus enabling them to use the full time of the most dependable labor to be secured; their income is the most steady and their profits the most sure.

I do not wish to be understood as having any thought of exploiting the dairy business as a bonanza business or as a get-rich-quick scheme. There are no bonanzas in legitimate farming. Success comes only by making good uses of the "here a little and there a little," by intelligence, industry, frugality, and the exercise and application of conservative business methods and principles.

As I have seen it and studied it, this is true of all lines of farming and dairy farming is no exception.

I do not desire to represent dairying as the only line of farm industry that is and can be made profitable, for there are many sections in which special crops are highly remunerative, as for instance, the numerous apple sections of the country, the early potatoes and vegetables of eastern Virginia, of New Jersey and

Long Island; the potatoes in Aroostook County, Maine, or tobacco in Lancaster County, Pennsylvania. But these favored sections are mere specks on the geography of the nation. Indeed in many of these specializing sections, dairying is carried on extensively if not always in connection with, certainly collaterally to, the various special crops; and many a time when prices or weather conditions are against the special crops, the dairy is an anchor in reserve.

The markets for good dairy products are no longer limited to the territory contiguous to the large cities, but are found all over the land where men live in groups and have a taste for good living; in fact, some of the best markets for milk and butter are found in our smaller cities where the trade in dairy products is not sufficiently large to attract the attention of those who form trusts and combinations in natural food supplies.

Such markets are well worth the study of dairymen located near them, for the astute dairyman may do a great deal toward improving a naturally good market.

He should work to cater to and meet all the needs and notions of the most particular customers and educate up to his standard the tastes of the less exacting ones. By the cleanliness, the purity, the superiority, the attractiveness of his product, as it comes to the customer or consumer, he can gradually command the top prices—the prices good livers are willing to pay for luxuries. The dairyman who is supplying luxuries to his trade is generally making more money than the one who is supplying merely the milk and butter of commerce.

The honest dairyman may work toward this finer trade with a clear conscience, for the purer and more wholesome the food he is supplying his customers, the more he is a benefactor to such customers in particular and to society at large, for the purity of his product is a conservation of the public health, and in doing a public service he is entitled to his full measure of compensation; and by demanding it, he can get it, having of course, earned it.

But the selling end of the dairy business is not the only important one. There must be minimum cost of production. In this lies the real profit of the business. It means the intelligence, industry, care and capability of the dairyman. It

contemplates the keeping of only profitable cows and keeping them and feeding them in conformity with the most advanced scientific practices, practically applied to the conditions of each particular farm.

There must be economical and systematic feeding and full feeding. There must be attention to the comfort of the cows, and, probably above all else, there must be close regard for the health of the animals.

Along with dairy performance, the breeder and feeder must work for endurance and constitution in his stock. This animated dairy machine must not only be a good worker but a long wearer as well.

Good dairying means good farming and the fullest possible profitable farm production of dairy feeds. This is one of the fundamentals of successful animal husbandry, and the fullest dairy success must be based upon it. The farmer dairyman should grow only profitable crops that he may dispose of to himself as a dairy farmer. To illustrate: Obviously the Maine farmer who can produce sugar corn for the canners at $120 per acre cannot afford to use the land producing it for growing say $50 worth of flint corn, simply because the latter is an excellent cow feed. In his particular case, however, I suspect there are times when the farmer can supply his market with sugar corn and by plowing up perhaps some unprofitable pasture or meadow grow his cow corn also. This is merely a suggestion, given for what it is worth to the thoughtful dairyman who is paying heavy feed bills.

Finally, dairy farming means land fertility, for it means manure making and economical manure saving and using. Manure is the land's by-product, its life, its ability to produce maximum yields of normally grown crops and to keep at it as long as man shall live by the tending of his flocks and herds in providing food and raiment for all the generations of his kind that shall people the earth.

ADDRESSES DELIVERED AT STATE DAIRY CONFERENCE, PORTLAND, DECEMBER 28 AND 29, 1911.

FEEDS FOR DAIRY COWS.

By Prof. J. M. Bartlett, Maine Agricultural Experiment Station, Orono.

As regards dairying our climate is not the most favorable, our winters being long and our summers short. If we could change for one that would give perpetual grazing such as Maine pastures furnish in June, and new fresh grasses, which form the ideal food for the dairy cow, were springing up in abundance every day, the problem of feeds could be omitted from the program of the annual meeting of the Dairy Association, and considered a dead issue in which no one, even the cow herself, would be interested; but as our climate falls far short of giving this ideal condition, and comes nearer to being as Mark Twain said, "nine months winter and three months late in the fall," we shall have to continue to struggle with the question of economical feeding, and endeavor to find some way of saving at least a portion of the check that is received for cream or butter from going to pay the grain bill.

The dairyman in order to make his business profitable must grow as much as possible of his feeds and to do this several factors must be taken into consideration:

(1). The adaptability of the crops grown to the soil and climate.

(2). The adaptability of the crops to the dairy cow.

(3). The capacity of the crops grown to produce digestible food.

(4). The protein supply.

1. As a rule in this country but little attention is given to our native grasses and but few farmers have any accurate information of the species of grasses that grow on their grazing lands and, therefore, are unable to tell what species are adaptable to their conditions. It is essential in dealing with meadows and pasture lands, to know especially what members of the grass family and other forage plants find the conditions congenial to them. It is often remarked with much reason that more is to be gained by the proper selection and proper care of the forage crops which have grown successfully, though perhaps unnoticed, among us for years, than by seeking for better results from some newly introduced species. No cultivated plant possesses qualities that will defend the farmer against the evil effects of poor culture, and when intelligent thorough methods are applied, many of the familiar species will do all we can reasonably expect. Occasionally a new and valuable species is introduced which may serve a useful purpose, as in the case of alfalfa in some sections, but in general a more economical production of cattle foods will be reached more surely through an improvement of methods in growing what we already have.

2. The home produced feeds for a dairy farm must obviously be adapted to the cow. A herd of good cows can hardly be most successfully managed on the old basis of exclusive pasturing in summer and exclusive dry food in the winter. To attain the best results the pasture must be amended by soiling crops, at least during the late summer and early autumn, and a succulent food, as silage or roots, is a decided improvement to a winter ration.

3. The productive capacity of the different forage crops used as cattle foods is very unlike. For instance a good crop of maize contains very much more dry matter per acre than do oats or peas or any of the grains, and in order that land may yield a maximum supply of feeds it is necessary to go outside grass and grain farming when long rotations are practiced and the larger part of the farm kept in grasses. Rapid rotation and the use of the more grossly feeding plants are necessary to a proper development of the resources of the land. Other things being equal, the most desirable crop is the one that will produce the most digestible dry matter per acre. This will not

be the same crop for all localities. In our short summer season we must have something that will grow rapidly and mature in a few months. In a warmer and more favorable climate there is probably nothing equal to alfalfa for this purpose, but unfortunately it is not adaptable to Maine conditions. Maize or Indian corn has always stood and still stands at or near the head of the list in amount of total and digestible food it will produce per acre and without doubt it is one of the most valuable crops to the dairyman. It does not follow, however, that the largest yielding crop is always the most economical to grow. The cost of production must be taken into consideration and this is a matter that each individual must settle for himself. The following table gives the relative yields of total and digestible dry matter per acre of some of our more common field crops:—

	Total dry matter.	Digestible dry matter.
Maize	7,500 lbs.	5,000 lbs.
Red clover	5,400 "	3,000 "
Oats and peas	3,240 "	2,100 "
Timothy	4,240 "	2,500 "
Hungarian	4,750 "	3,180 "
Mangolds	6,000 "	5,200 "

The figures here given show what can be produced and has been produced on good land with good cultivation.

4. The protein supply of the farm may be increased by growing leguminous crops such as peas, beans and clover, in so far as our climate will permit. These crops not only furnish valuable food but are great soil renovators, and the growing of a crop of clover leaves a soil richer in nitrogen than it was before. The common red clover is a biennial and is best grown in rotation with other crops. Alsike is something of a perennial and maintains a hold in the grass land after the red clover is gone. For this reason many farmers use mixtures of the two varieties in seeding. The alsike is not so strong a grower or as good a soil renovator as the red clover. The clovers are probably the cheapest source of home grown protein. They are not a costly crop to grow, improve the mechanical condition of the

soil, translocate mineral plant food from lower to higher soil levels, and produce considerable amounts of digestible protein if properly harvested and cured.

SOILING CROPS.

The production of soiling or green crops as an amendment to the pasture is a practice essential to the highest success in dairying on most farms. There are few pastures, if any, that afford grazing in August and September sufficient to keep up the milk flow. It is no longer a debatable question whether soiling is profitable, for unlimited testimony can be furnished to show that much more food can be produced per acre by this method than by pasturage. Maine farmers, however, owning upland rocky pastures in which grow native grasses of the best quality for dairy animals, could not wisely discard them. Such lands are usually cheap and the labor of supplying food by this method is reduced to a minimum. The crops recommended for soiling in this climate are, for early summer, last of June or first of July, winter rye, which should be sown early in August; for last of July and first of August, Canada field peas and oats, which sown together are a very satisfactory crop and furnish more protein than oats alone; for last of August and first of September, corn and Hungarian grass, either of which yield abundantly under good cultivation and are highly relished by stock when fed green.

COMMERCIAL FEEDS.

Notwithstanding the great desirability of producing all the food that our stock needs on the farm and thereby saving a large grain bill, it is not probable that in our climate with its short growing season we will ever be able to do so and conduct a business of any size. If we were farther south where 3 or 4 crops of alfalfa or some equally good feed could be grown on the same ground each season, the prospect would be brighter for growing all of our feeds on the farm. About all we can hope to do is to produce all our course fodders such as hay, silage, etc., and a part of our concentrates in corn, oats, peas, barley, etc., depending on the West and South for the remainder. Commercial feeds now, like fertilizers, are quite largely bought on chemical analyses. We have learned through chemistry that the protein, carbohydrate materials, fat and ash of

feeds, are the valuable ingredients, as likewise are nitrogen, phosphoric acid and potash in fertilizers. Consequently, in order to know the value of a feed and to buy intelligently we must know its analysis or the amount of these valuable ingredients it contains. The nitrogen in the fertilizer is its most costly and valuable ingredient. The protein of feeds is manufactured from this element nitrogen combined with several other elements, by the plant itself. These nitrogeneous compounds, or proteids as we call them, are made only by plants. As far as is known the animal cannot manufacture proteids except from like bodies it gets from the plant, and the plant is the only living thing that can take the mineral nitrogen from the soil and make protein from it.

Why is protein necessary? The lean meat, the muscles, the connective tissues, the skin, the horns, the hoofs, and the hair are all made from the proteids of the food and can be made from nothing else. Also the casein of the milk is made from this material. The necessity for a sufficient ration of protein is therefore self-evident and does not need to be emphasized. A growing animal or one that is making lean meat or muscle rapidly needs a ration carrying a larger percent of protein than the mature animal. Likewise the dairy cow producing a large amount of casein in her milk needs more to sustain her than the mature ox. The office of the carbohydrates is to produce heat and energy, also fat, in the animal body. The office of the ash or mineral constituents is to form the bone or frame of the animal. It is also now believed that the organic phosphorous compounds perform an important office in the process of nutrition.

What feeds shall we buy? In buying feeds usually the most concentrated offered on the market will be found to be the most economical. We cannot afford to pay freight long distances on fillers or waste materials. As a general rule the farmer can produce the carbohydrates or energy forming material more cheaply, in the form of mature corn silage or roots, than he can protein. He consequently must look to the cheapest source of obtaining this latter material. You are all familiar with concentrates carrying high percentages of protein, such as cotton-seed meal, linseed meal, distillers grains, gluten feed, etc., and the only question is which will furnish protein cheapest. I take from the Vermont Station Bulletin 144 the following:—

	Protein %.	Price per ton.	Cost of protein per lb.
Cottonseed meal.....	40.4	32.25	4 cents
Linseed meal.....	38.7	34.25	4.4 "
Distillers grains.....	29.9	33.50	5.6 "
Gluten feeds.....	25.6	32.50	6.4 "
Molasses feeds and oat feeds.....	15.8	29.00	8.9 "
Oat feeds; corn and oat feeds.....	9.6	41.00	16.1 "

Another thing which should be taken into consideration in buying concentrated feeds is their fertilizing value. This is an important item to the Maine farmer who often spends hundreds of dollars for commercial fertilizer, for when we figure the value of the fertilizing ingredients in a ton of concentrates on the same basis used in calculating the value of fertilizers, we have the following:—

Cottonseed Meal—nitrogen 6.64%; value.....	$26 56
" " —phosphoric acid 2.68%; value.....	2 14
" " —potash 1.79%; value.....	1 79
Total.....	$30 49
Linseed meal—nitrogen 6.01%; value.....	$24 32
" " —phosphoric acid 2.89%; value.....	1 31
" " —potash 1.37%; value.....	1 37
Total.....	$27 00
Wheat bran—nitrogen 2.67%; value.....	$10 68
" " —phosphoric acid 2.89%; value.....	2 31
" " —potash 1.61%; value.....	1 61
Total.....	$14 60

When these materials are fed to mature cows and only the butter or cream is sold, about 90 per cent of the fertilizing value is retained on the farm if the manure is properly handled and cared for. If we should allow 25 per cent for waste of fertilizing material the ton of cottonseed meal would still be worth about $23, which taken from the cost price would very materially reduce its price as a feed.

Perhaps it will not be out of place to discuss to some extent some of the feeds that are offered for sale on the markets at the present time. I wish to say just a word about the cottonseed meals that are now being sold in Maine. I have told you

already that these meals are the cheapest source of protein on the market and that is true, but they are not, however, as cheap today as 3 or 4 years ago. The price has gone up and the protein content down. The best grade, or choice meals, were formerly guaranteed 43 per cent protein, but for the last two seasons the guaranty has been reduced to 41 per cent and also there are many failures to maintain this lower standard. The chief cause of the lowering of the standard and decrease in the percentage of protein is a too great admixture of cottonseed hulls and lint with the meal. A small amount of the lint and hulls inevitably enters into the composition of the best meals. In the process of manufacture the seeds are crushed and the meats which are rich in protein are separated from the hulls, which have but little feed value. Of late the machinery or process of manufacture has been changed slightly to prevent loss of meats, some portions of which go into the hulls, and in making this saving more of the hulls are introduced into the meal, reducing its value and giving it a somewhat darker color. The quality of the meal also varies somewhat with the season. In a dry season the meal is a nice bright yellow color, rich in protein; but in a wet season it is likely to be dark, due to a fermentation which is sometimes started in the boll or after the seed is separated and stored awaiting the process of grinding. In very wet seasons a large amount of meal is so damaged in this way that it can only be used for fertilizer. The color of meal is indicative of its quality. A nice bright yellow meal with a fine nutty flavor, you can be sure is choice and all right. The dark color is due to one of three causes:

1. Over-heating during the cooking process.
2. Fermentation in the seed.
3. Undue admixture of hulls.

The first may injure the flavor of the meal but it is doubtful if its feeding value would be materially affected. The second may or may not render the meal wholly unfit for feeding purposes, depending on the extent to which the fermentation has been carried. The third lessens the feeding value of the product and increases the cost of protein.

A simple test for hulls may be made by putting a teaspoonful of meal in a half glass of water, stirring well, then allowing the whole to settle for a few minutes. If an excess of hulls is pres-

ent they will settle to the bottom of the tumbler and can readily be detected, as a black sediment, by looking through the bottom of the glass. All meals contain some hulls but an excess is readily detected by the bottom of the tumbler being well covered with them.

Cottonseed feed is a product made by one or two concerns in the South that make a business of buying hulls as they come from the oil mills for the lint that is on them. The lint is removed, treated by a chemical process to purify it and sold in the markets for making gun cotton and various other purposes. The hulls which are left contain some meats and have some feeding value but not sufficient to make them marketable. Therefore, to dispose of them, they are finely ground, mixed with an equal weight of choice cottonseed meal and sold as cottonseed feed with a guaranty of one-half that of cottonseed meal. There is nothing fraudulent about this feed. It is sold for just what it is and no attempt is made by the manufacturers, at least, to deceive anyone. The price, however, for these goods in Maine is much more than half that asked for choice cottonseed meal and often over 75 per cent of that of the best meals. The farmers of Maine can hardly afford to pay freight on hulls from the South for feeding purposes even if they were shipped f. o. b. from southern points.

Another class of feeds which I think should be especially mentioned is the adulterated wheat offals which were sold until the change in the feed law this year, as mixed feeds. Now they are labeled "feeds" without the word "mixed" attached, it having been ruled that the term "mixed feed" could only be applied to straight wheat offals. These adulterated feeds are made usually by mixing with a straight mixed feed about 25 per cent of finely ground corn cobs which have practically no feeding value. By the addition of this material the protein content of the feed is reduced from about 16 per cent to about 12 and in many instances less. These feeds are sold usually for only one or two dollars less per ton than the pure goods but their feeding value is reduced one-fourth. It is very evident, therefore, that such feeds are not economical to buy and should be avoided. But few of them were found on the market at our last inspection and it is gratifying to note that their sale is decreasing.

Before closing I wish to speak of another class of feeds which seem to be gaining quite a foothold in some sections and these are molasses feeds, so-called. There is no question but that molasses is a valuable food for man or beast and the use of the lower grades as feed for cows is certainly to be commended. Recent work done at the Massachusetts Experiment Station, however, shows that it must be fed with care and judgment to secure good results. When fed with hay it seemed to depress digestibility and when compared with corn meal a smaller yield of both milk and butter was obtained. This was probably due, however, to a lack of protein in the ration, as the molasses carried practically none and the corn meal 11 per cent. Molasses, of course, is a carbohydrate material carrying 50 per cent or more of sugar and should be fed with grains rich in protein as cottonseed meal, linseed meal, distillers grains, etc., to secure the best results. It can be used to render unpalatable feeds more palatable and sometimes effect a saving in that manner.

The advisability of buying the molasses feeds upon the market depends on their price and composition. If they were made of pure materials such as one would compound for his own use with an admixture of about 20 per cent of molasses, no objection could be made to them on the score of feed value, but as many of them have been found to contain large amounts of screenings, weed seeds, and materials of doubtful feeding value, they should be purchased with caution. The best manufacturers now, however, claim to treat all screenings so as to kill the weed seeds, which, if true, is an improvement over old conditions. It is still a question, however, if it would not be better for a dairyman who wishes to feed molasses to compound his own grain rations and buy the feed molasses which we can obtain at from 12 to 15 cents per gallon by the barrel. He would then know what he is feeding and could add the molasses to the grain ration in quantities to secure the best results.

Ques. Have you made any figures on the gluten feeds?

Ans. When gluten feed is bought for just protein alone, the cost of the protein would be 6.4 cents per lb., but you must remember that gluten feed is made from corn and contains considerable material which is valuable besides the protein. It sells about as high as cottonseed meal and if you are going to make up a ration you can probably make it up cheaper with a mixture of cottonseed meal and corn meal than by using gluten feed.

Ques. Do you think we would get better results from gluten feed than from cottonseed?

Ans. That is one of the problems the feeder has to work out. We cannot feed all cows alike. They have individual characteristics the same as people. Some cows will do better on one feed than on another of about the same quality. It is difficult to make any hard and fast rules. There is no other source from which you can buy protein of as good quality as in cottonseed meal. I do not mean to say that cottonseed meal will give you better results than gluten meal, if fed alone; probably it will not, but I think you can find as many dairymen that have obtained good results with a combination of cottonseed meal, corn meal and bran as with a gluten feed.

Ques. In examining molasses feeds did you ever discover any weed seeds ground up?

Ans. Nearly all that we have examined have contained large amounts of weed seeds. In the first of these feeds that came into the State these weed seeds had not been destroyed. Then they were certainly pernicious feeds, but there has been so much criticism made that now the best manufacturers of molasses feeds claim that they have ground all the weed seeds or killed them by heat, so they will not germinate. Weed seeds contain protein, but as to their value we cannot say. All proteins are not alike, nor are all nitrogen compounds. The nitrogen compounds in weed seeds may not all be proteids and if not they would not have any value as a protein food.

Ques. Don't you think that feeders many times feed the cows too much grain, more than they require, so that there is practically a waste?

Ans. I am sure of it. I went into a man's barn once when cottonseed meal was very low,—selling for $23 and $24 a ton, and I found he was feeding four quarts of cottonseed meal at a feed to his cows. He had worked them up to that gradually so they could stand it, but it was certainly a great waste of the protein for an ordinary cow.

THE VALUE OF THE TUBERCULIN TEST.

By W. H. SPEAR, D. V. S., Portland, Me.

Mr. J. P. Buckley, State Commissioner of Agriculture, has requested me to read a paper on the value of the tuberculin test. In preparing this I felt it would not be out of place to define bacteria and describe briefly the germ theory of disease.

All soil, air, water and living beings, vegetable and animal, are pervaded with many forms of minute vegetable life. They belong to several distinct classes of families but on account of their microscopic size they are generally grouped under one name as microorganisms. Bacteria, also called microbes and germs, are microscopic plants consisting of single cells containing protoplasm, the vital substance by which the processes of nutrition, secretion and tissue building are utilized; and they reproduce themselves by the division of the parent cell into two smaller cells, the process being constantly repeated. Under the more favorable conditions they multiply with great rapidity and a bacterium may develop and be ready to reproduce itself in a few minutes. In milk, germs seem to find ideal conditions, over two hundred distinct types of harmless and harmful bacteria having already been found in its products, old and new, up to the present time. They are at present provisionally divided into groups based mainly upon their form. The principal groups are the globe, or round cell shaped bacteria (micrococcus), the rod shaped bacteria (bacillus) and the spiral or corkscrew bacteria (spirillus), and each of these has many hundred species. Warmth, moisture and organic matter favor bacteria growth, while sunlight, the best of all disinfectants, and low temperatures retard them. Some species are readily destroyed, others are very resistant, even to extreme degrees of heat and cold. Disease is often the result of the growth of bacteria in the bodily tissues, and the pathogenic (disease-producing) germs are mainly micrococci and bacilli. The product

of their growth is poisonous, and a definite disease is due to the effects of the poisons (ptomains) produced by a definite species of germs. Thus diphtheria, typhoid fever, leprosy, cholera and tuberculosis have their separate germs recognizable and distinguishable, one from the other. The germ "bacillus-tuberculosis" is a parasitic vegetable microorganism, which when placed under that instrument which has conquered the world of minuteness for natural science, appears to the eye as a slender rod-like body. It measures upon an average about one ten-thousandth of an inch in length, and it is this little organism that is accountable for the deaths of fourteen per cent of the population of the world.

The germ lives in the animal tissues and thrives best at a little above the normal temperature of the human body. It has great vitality, resisting heat at any temperature below 150 degrees F., moisture, drought, decay, and often all the processes of digestion. The tubercle-bacilli have lived for many weeks on ice and been found equally virulent on thawing, and the sputa of consumptives dried on glass and formed into dust will inoculate guinea pigs four to six months afterwards and Koch has cultures three years old which have passed through forty generations and still retain their virulence.

That the disease is contagious has been recognized for many decades, while the revelations of the post-mortem rooms connected with metropolitan hospitals in this and other countries have shown that sixty per cent of hospital patients who die have suffered at some time in their lives from infection, as evidenced by the characteristic lesions which have been left behind, thus proving pulmonary consumption to be no more than a fragment of a great constitutional malady.

There are three methods of infection: (1) by inhalation (breathing the germs into the lungs); (2) by ingestion (swallowing the germs in milk or other food); (3) during coition when sexual organs are tuberculous; (4) from a tuberculous mother to foetus in the uterus. It must be distinctly understood that the breath of the tuberculous is not in itself infecting. It is the prevalent diffusion of millions of infected germs and their distribution in dust so that they can be easily inhaled that remain the great source of danger.

The bacillus-tuberculosis, from whatever animal derived, has a similar, apparently an almost identical morphology, and its

propagations through dust agree no matter what the source from which it was obtained.

Late in November, 1890, Koch first published the results of experimental work upon tuberculous guinea pigs with a fluid of his own preparation. This fluid, which he called tuberculin, was stated at a later date to be highly concentrated, sterilized and filtered liquids in which pure cultures of the "bacillus-tuberculosis" had been grown; a pure culture consisting of the growth of one species of germ by itself, all others being excluded.

Tuberculin is prepared by growing the tubercle-bacilli in a pure culture until a large amount of ptomains is developed. Glycerine and carbolic acid are then added, and the mixture is filtered to remove germs. The filtered product is then heated to 225 degrees F. to destroy the vitality of any germs which may have passed the filtering process, and then evaporated at a low temperature until concentrated. Koch's newest method is an apparatus for crushing the bacilli; by its means micro-organisms are crushed and destroyed, while the spores and toxines that escape are largely destroyed by sterilization.

The test upon cattle is made as most of you know, by injecting the fluid under the skin of the neck or shoulder by means of a sterilized hypodermic syringe, two cubic-centimeters of a ten per cent solution being used. The normal temperature of the cows may vary from 100 degrees to 102 degrees and is taken before or at the time of injection, and tuberculous animals respond by a rise in temperature, usually beginning from eight to ten hours after injection and continuing as late as the twenty-fourth hour. The great objection to the action of tuberculin in the human patient is that it acts as an excitant, arousing germs to increased activity and tending to scatter the infection throughout the body, as shown by a rise of temperature of from 2 degrees to 8 degrees F., but the very features which prohibit its use as a cure, are those which have given it its great value and popularity as a diagnostic agent in determining the disease in cattle. When tuberculin is introduced into the body of an animal in the slightest degree affected by tuberculosis, the tolerance of the system which had been gradually acquired, is overcome, and the toxic effect is manifested in what is termed a reaction; while as proof of its harmless effects upon well animals, among the first tests made in New England were those

at the Vermont Experiment Station in the case of a cow which was tested every six months for four or five years, and then gave the largest milk and butter record ever got at the Station from any cow, of any breed; and during the experiments at the Bureau of Animal Industry, Washington, D. C., over 3,000 c. c. of tuberculin were injected into a cow at intervals, and the animal remained in perfect health at the close of the year. If the living bacilli are not in the system, the amount injected fails to make any impression whatever and is properly eliminated.

Among the objections which have been raised to its employment in cattle, but few of them will stand the test of scientific investigation, and as experience in its use has brought a greater measure of success, unfavorable reports are becoming rare, and many who considered tuberculin unreliable are now acknowledging that the fault was their own, and that conclusions had been reached from far too restricted premises.

A survey of the whole field shows, that if at the time of testing, suitable aseptic precautions have been observed, the animal is not in heat, or near parturition, and there is at the time no concurrent disease, not two percent of cows will react upon the first test unless tuberculosis is present, while my convictions are daily being strengthened by practical work, that no animal reacting under such conditions should ever be released from quarantine, and again allowed to associate with sound animals. I have encountered in my practice a few well advanced cases of tuberculosis that absolutely refused to show any reaction to tuberculin, where the system of the animal was so thoroughly saturated with natural tuberculin that the slight addition injected had no apparent effect, but such animals have only been safely condemned by physical examination.

The claim that in some cases cattle would react to tuberculin where no tuberculosis could be found upon post-mortem, is largely attributed to the crude and rough-shod manner of holding autopsies in barnyards or open fields where a thorough search was often impossible. Often a few small tubercles at the bifurcation of the trachea may be overlooked and Nocard states that "There is a stage in the period of incubation when it is too early for the tubercle to have been formed yet the reaction shows the presence of the disease," but it is impossible to define that stage. Tuberculosis of the joints and bones

is often found but would be overlooked by a careless man on post-mortem.

Other objections made are that the tuberculin test is too accurate, because it condemns cattle so lightly diseased they ought not to be destroyed. A cow is tuberculous, however, if but one lymphatic gland be affected, and contains the specific germ of the disease, and if tuberculous at all, she may be infectious, and such mild or latent cases are liable to assume at any time an acute type under unusual conditions, and cows may appear to be in ideal physical condition so far as the eye could read external symptoms, while "within they are like whited sepulchres full of dead men's bones."

The type of tuberculosis common among cattle is decidedly chronic and rarely acute. Mankind usually show the disease by failing health in much earlier stages than bovines, the latter failing to show external evidence of the disease until it is far advanced. Their appetite and function of digestion do not appear to be interfered with, and they readily take on flesh, and produce large quantities of milk, while extensive lesions of tuberculosis are present.

While employed as U. S. Government Inspector in the large packing houses in South Omaha, I recall one case of a steer weighing 1200 pounds which previous to being slaughtered was in ideal condition but on post-mortem, extensive lesions of tuberculosis were found and this was only one of many such cases. I also have in mind a herd I visited in Falmouth three or four years ago among which was a very fine Jersey, apparently perfectly healthy. The owner said, "Dr. Spear, there is a cow I have picked out as the best one in the stable," and in appearance she certainly was but to our utter surprise after injecting the tuberculin and taking the temperature next morning she had a rise of four degrees, stood with head down and not taking much notice of things around her. On post-mortem tuberculous lesions were found pretty well distributed. The owner told me his baby had been fed on this particular cow's milk and had not seemed well for some time and he had wondered if it could be the milk. This only proves positively that it is simply impossible to diagnose tuberculosis in some animals without applying the tuberculin test, unless the animal be in the very last stages of the disease.

I also recall a dairy of cows in Cumberland I was asked to test, eighteen in number. They were stancheled in a basement tie-up with very little sunlight and practically no ventilation, only a small door to enter and a half-sized window in one end, and it was necessary to use a lantern to find the animals. Each stood with its head up against a stone wall with no access to air. On applying the test, 17 of the herd responded with a typical reaction and the 18th was condemned on physical condition, she being one of the cases too bad to react. On post-mortem all were found badly affected. It cannot be too strongly emphasized that housing animals under such conditions is sure to bring disease, destruction of herd and great loss to the farmer.

In 1898, Bang, of Copenhagen, one of the highest European authorities, in his paper presented to the Congress for the Study of Human and Animal Tuberculosis, at Paris, said that numerous tests made in almost every civilized country had demonstrated that in the majority of cases tuberculin is an excellent means for diagnosing the existence or the non-existence of the disease, but giving us no positive information as to the extent to which the disease has progressed.

Nocard, of Paris, wrote also in 1898 as follows: "The degree of certainty of the indications furnished may be stated in precise terms. The observation of a clear reaction to tuberculin is unequivocal; the animal is tuberculous. The pretended errors imputed to the method are explained by the extreme sensitiveness of the reagent, which is capable of detecting the smallest lesion.

Direct experiments and observations collected by thousands show that the tuberculin injections have no unfavorable effect. With healthy animals the system is indifferent to the inoculation; with tuberculous animals it causes only slight changes, which are not at all serious."

These opinions of eminent authorities living in different countries, after long experience of their own and after studying the results of the many tests made in different parts of the world, should have great weight; they are essentially the same throughout. A similar conclusion was reached from experiments made in the Bureau of Animal Industry in 1893. In the extensively diseased herd of the Washington Soldiers' Home 60 animals were tested, all of which were afterwards slaugh-

tered and carefully examined. Of the 60 animals tested, 49 reacted and 11 failed to react. Tuberculosis lesions were found in 48 of the animals which reacted. Five animals which did not react were also found to be diseased. One of these had a high temperature (103.6 degrees F.) the day before the test, and this animal had extensive tuberculosis. The disease had been recognized in this animal from external appearance, and it had been isolated from the herd from 15 to 18 months. Three other animals which did not react were in all probability stationary cases of disease; the nodules were small and largely calcareous. In the remaining animal which failed to react the lesions were also small and apparently confined to the glands.

In 1897 Voges compiled statistics of tuberculin tests, the accuracy of which had been determined by post-mortem examination. Of 7,327 animals tested, it appeared that errors had been made with 204, or 2.78 per cent. In the work of the Pennsylvania Live Stock Sanitary Board post-mortem examinations were made on about 4,400 reacting cattle, and the disease was found in all but 8 of those which had given characteristic reactions.

The results of a much larger number of tests might be compiled at this time, but they would not materially change the average of those already mentioned. It is plain that tuberculin is a remarkably accurate test of tuberculosis; that the animals which react may be safely considered as tuberculous, and that when a careful clinical examination is practiced in addition to the test, there are few animals in a dangerous condition which escape detection.

The first questions asked by those who oppose the adoption of the tuberculin test are, Is this test infallible? and, If it is not infallible, why should it be forced upon the cattle owners of the country?

In answer to these questions it may be said that tuberculin is not absolutely infallible, and yet it is by far the best method of diagnosing tuberculosis that has been discovered.

Practically all the animals which react are affected with tuberculosis and should be separated from the herd, not only in the interest of the public but in the interest of the owner of the herd. The best authorities admit, after studying many thousands of tests, that there are few if any mistakes made in condemning cattle which show a typical tuberculin reaction. The

errors are principally in the other direction—that is, some tuberculous animals are not discovered by the tuberculin test; but as the most dangerous of these may be picked out by ordinary clinical examination, this fault of tuberculin is not so serious as it at first sight appears. This being the case, it should not be necessary to force the tuberculin test upon cattle owners. They should be anxious to adopt it in their own interests and for the protection of their patrons. There is today no greater danger to the cattle and hog industries than that which confronts them in the form of tuberculosis, a disease already wide-spread and rapidly extending. Without the use of tuberculin it would be impossible to control this disease, and the farmer and stock-raiser would be at its mercy. With tuberculin its control is not a difficult matter, and badly affected herds may be converted into healthy herds in a few years, and without very serious loss or hardship. Tuberculin is, therefore, a great boon to the farmer—one of the most beneficial scientific discoveries of modern times.

Some cattle owners have been prejudiced against the tuberculin test by incorrect or greatly exaggerated statements as to damage caused to cattle by the injection of tuberculin. Some of these statements have been based upon attacks of illness in no way connected with the tuberculin test.

Many persons have in recent years studied the effects of tuberculin as they have been revealed by tests covering vast numbers of animals, and in the present uncertain condition of the public mind in this country on the subject it is advisable to quote the conclusions of some of the best authorities.

Paige said, after the tests of the herds of the Massachusetts Agricultural College, that "Its use is not followed by any ill effects of a serious or permanent nature."

Lamson, of the New Hampshire College Agricultural Experiment Station, said, "There is abundant testimony that its use is not in any way injurious to a healthy animal."

From the investigations and observations that have been mentioned it may be safely concluded:

(1) That the tuberculin test is a wonderfully accurate method of determining whether an animal is affected with tuberculosis.

(2) That by the use of tuberculin the animals diseased with tuberculosis may be detected and removed from the herd, thereby eradicating the disease.

(3) That tuberculin has no injurious effect upon healthy cattle.

(4) That the comparatively small number of cattle which have aborted, suffered in health, or fallen off in condition after the tuberculin test were either diseased before the test was made or were affected by some cause other than the tuberculin.

The prime conditions, then, to secure pure milk are to demand the product of sound cows and that these cows are kept clean. The milk as soon as drawn should be reduced to a temperature below 50 degrees F. until pasteurized or consumed. I know that these conditions are much more easily demanded than enforced but I am told that the Maine Dairymen's Association has done much to better the unsanitary conditions of many of our farms and dairies.

In summarizing: Tuberculin may be said to be for the veterinarian what the X-Ray is to the medical practioner,—it invariably locates the presence of the disease.

In closing, I wish to urge that the watchword of our present Commission and Maine Dairymen's Association should be "No backward step." The farmers should assist the effort to eradicate this disease by trying to bring about better sanitary conditions in the dairies, by cleaning up, cleaning out and keeping clean by persistently applying the tuberculin test, and destroying the diseased animals as they are found from time to time.

I fully realize the opposition felt by some of the farmers in Maine for I know, as they do, that some of our profession have not been as honest and conscientious about the work as the test requires and it has reflected not only on the veterinarians throughout the State but on the work of the commission and in a way has hindered the good work which might have been accomplished. The test might well be opposed if carried on under some conditions which have been rumored. However, we have in the State a number of good reliable competent, honest and conscientious men and if the commission, the farmer and the veterinarian will work in unison the result will surely prove satisfactory and be of great benefit to the farmer and consumer without any ill effect upon the animal receiving the tuberculin test.

REMARKS.

By VAN W. CARLL, Live Stock Sanitary Commissioner.

I am not going to try to make a speech. I am no public speaker as you will soon learn, but I will try to talk with you a little in regard to my work. I have been connected with this work but a short time,—since the first of May, but during that time I have had considerable practical experience. I have already seen a great many cows killed and have held many post mortems myself and quite a good many in connection with some of our veterinarians. The tuberculin test surely is no longer an experiment, as Dr. Spear has already told you. It comes as near a perfect test, in my opinion, as anything can, when the tuberculin is applied under proper conditions and in a proper manner. To illustrate: Day before yesterday I had a case of an animal that was condemned,—a two-year-old thoroughbred heifer. The owner thought a great deal of her. I went into his barn and he said, "It seems to me a shame to kill such an animal as that." She was a beauty, fat enough for beef. He told me that a man from New Hampshire came to see the heifer after she was condemned and said he would give $50 for her and take his chances with her, and take her into New Hampshire. He knew that could not be done, but he thought it a shame to kill her. I went in beside her and for some reason I put my hand on her throat. I very quickly discovered something there that was wrong. We took her down into the field and killed her and after she was dressed I found on the back of the windpipe a large bunch that was a solid mass of tuberculous matter. We followed along in her lungs and the first time I took hold of the lung I found a bunch as large as a good sized hen's egg, and all through her intestinal tract we found bunches as large as peas. That was the condition of that animal. The man had raised her and thought she was perfectly healthy. The chances are that she would not have lived until spring. Of course we do find cases,

as the Doctor says, where the animal will not react to the tuberculin test because she has so much of the disease distributed through her system, but nine times out of ten a man who is used to stock will condemn that animal on a physical examination. We are taking very few chances in the tuberculin test if it is applied under proper conditions and applied in the proper manner. I am satisfied that the farmers of the State of Maine do not realize what the State is doing for them at the present time, in regard to their stock. Cut out the tuberculin test, cut out the appropriation that the State of Maine is giving today, do nothing in that line, and where would the stock and where would the health of the people in the State of Maine be in five years from today? Many men who have said that the tuberculin test was a farce after they have seen one diseased animal opened will say that they are ready to hold up both hands and vote for the State of Maine to pass a law that every animal in the State shall be tested with the tuberculin test.

I believe that the time is coming, and it ought not to be far off, when that shall be done. We are not eradicating the disease as we ought to for the reason that we are not obliged to test. A man on this side of the road will have his cattle tested and will do all he can to stamp out the disease. His neighbor on the other side of the road says it is a humbug and will not have anything to do with it. He may have a cow that is diseased and sell her and she will go into a herd where there are twenty and next year the State will have ten out of that herd. So we are not getting along as we should if every animal was tested. If you clean out your herd at the present time and buy more cows, unless you insist that they are tested, you are liable to buy the disease right back again. So it is not advisable for the State to take any backward steps, but we should press on and do all we can. I believe the stock interests and the health of the people of Maine today depend as much on the health of our dairy herds as on any one thing.

FARM MANAGEMENT.

By W. T. GUPTILL, State Dairy Instructor.

Ladies and Gentlemen:

I am not a professional man; I am not in any sense of the word a scientific man; consequently anything that I have to say in regard to farm management will bear directly upon the financial returns of the farmer, and any system of farm management that does not provide at the end of the year a substantial financial gain, something with which the man can pay his taxes, and keep his family up to standard and improve a little, I consider defective, no matter whether the man is a professional man and supports his family from other sources, whether he is a scientific man and is farming for scientific purposes, or whether he is farming for a living.

Of course we have different conditions in different parts of the State. For instance, up in Aroostook County there are specialized farmers, and they are not entirely confined to Aroostook County. We find them in Penobscot County. We find them in Waldo County and over in Kennebec; and sometimes in Oxford County we find men who are devoting their attention entirely to orcharding. In other places, and particularly in the southern and western part of the State, men are devoting their attention entirely to dairying. In Aroostook County the farmers absolutely buy their eggs, butter, pork and beef, as well as their horses. Some of the farmers who are fruit growers just raise those things that are necessary for their family and for the money crop depend entirely upon the apple crop. Now it seems to me, as I have observed those things, that with those farmers it is either a feast or a famine. If the crop is large, or even if it is moderate, and the price is high, it is a feast; if the crop is large and the price is small—below the cost of production—it is a famine. They have to pay for their fertilizer and other expenses and when they have a poor year it makes it

hard for them. Take the apple crop. Some years of course you get a pretty high price for your apples, get enough to satisfy even the most exacting; and the next year perhaps you will not get enough to pay expenses. It is a hard matter for a man to carry over from one year to another funds enough to pay his running expenses and keep his farm in condition. Now I have to suggest another method, which is practiced to some extent, and that is, have a dairy which you carry along for the support of your family in hard years, to depend upon to pay your running expenses, and a diversified farm crop. For a cash crop, it seems to me that the farmer should depend upon at least three or four crops. The objection to this is, first, that it requires a knowledge of the crops that you are raising. I will suggest that there are four crops that it is desirable to raise for money crops. The first is hay. I do not mean by that to sell hay promiscuously. If you have ten or twelve acres under cultivation, two or three in squash, two or three in cabbage, three or four in potatoes, and perhaps three or four in corn for your stock, the next year you have the grain that grows on that ground to feed your stock, with your corn, and you do not have to go into the channels of commerce to buy grain to carry your stock along. The instant you reach out to buy something, you are not only paying the man who produced the crop, but you are also paying every man who handled that crop, and I do not think that is profitable. I think it is nothing but fair to ourselves to produce practically all the grain we feed. I am not going to say all of it because that is impossible. But if you have good productive land under cultivation so that you can seed grain,—oats and barley, you can raise a large proportion of your grain. I think barley should be raised more than it is, and wheat to some extent. Of course the weevil in the old time drove our fathers out of the wheat business, but wheat is a very good feed, especially for hens. It works in very nicely for the young stock. Now, as I have said, I am going to suggest that you raise four money crops,—first, hay; second, potatoes; third, cabbage; and fourth, squash. Seed your ground, 10 or 12 acres, to grain, together with clover and herdsgrass. Next year cut your clover for feed and the next year sell your timothy. There isn't a big lot of waste in selling timothy, especially if it sells at a high price. A man can afford to sell timothy, even on a dairy farm, at $20. It is not a valuable feed for the dairy. It sells well in the mar-

kets because the feeders of horses in the cities demand it, and of course let them have it. Feed your clover, feed your roughage on the farm and keep it there, and do not carry stock enough so but you can sell your timothy. Then I would suggest that you raise potatoes. I raise potatoes and I have followed the market and I find it profitable, on the whole, although there are some years when it is not. It requires thorough tillage of the soil to raise potatoes. If you are successful in potato growing it handles the soil so as to put it in shape to grow a crop of oats or barley, a crop of clover and a crop of timothy afterwards, without any additional dressing except what we put on as fertilizer at the time the potatoes were planted.

I would also suggest that you raise cabbage, and I would also suggest that you raise squash. Why I suggest this is because some time ago I got in communication with a firm here in Portland, and they come over to my farm and say things that are of direct consequence to me. They come from the commercial side and I am running my farm for the benefit I receive commercially. They sent over a young fellow and I didn't pay much attention to him. This was back two or three years ago. I had a carload of cabbage and two or three carloads of potatoes, and I had hay to sell also, but no squash. He said to me, "I think a man ought to diversify his crops." I said, "Yes," on general principles. I did not expect he was going to say anything to me that I would really care to hear, and I was thinking that I would like to have him make me an offer for those cabbages and potatoes. He said, "If a man has diversified crops, he will generally find that two or three of them are high in price, while one of them he will get out of just whole. He will find one of them cheap, and occasionally two of them cheap." I began studying what he had said and I have found that in the last four years it has been about like this: For instance, today squashes are very cheap; they are worth eight or ten dollars. Cabbage is doing pretty well, potatoes are doing pretty well and hay is doing pretty well. Now if you have followed the system of management suggested, you will have your stock on the farm, to consume the stuff that you could not put on to the market profitably, and in this way you will get it back on the farm to assist in keeping up the humus in the soil. You will need to go into the market and buy fertilizers, because you have got to keep the fertility up to even a higher standard than if you put

all of the produce back on the farm. This year, as I have said, squashes are cheap, cabbages are worth $20, potatoes 90 to 95 cents, and hay probably $20. Let us see how it was last year. Last year cabbages were worth eight or ten dollars a ton, and I think they touched twelve or fifteen late in the spring. Squashes began at $20 and $22 and finally reached $30 and $31. Potatoes were a drug on the market and hay was high. Last year we had squashes and hay high, cabbages and potatoes cheap. You could get out of it whole on cabbages and potatoes and you could make money on what hay and squashes you had to sell. The year before, the same conditions existed,— cabbages and potatoes were cheap and squashes and hay were high. The year preceding squashes were absolutely given away over to the Cape, cabbages were worth $45 a ton, potatoes a dollar a bushel and hay $18 a ton. I will not dwell on this any longer. Of course every man ought to diversify his crop. If he does not want to raise those particular crops that appeal to me, he can figure it out and find four crops that he can raise.

Further than the knowledge of raising these crops which you must have, and which you can get from whatever source you please, is the equipment. Of course the equipment for raising potatoes is the most expensive. You not only require good tools, planters, cultivators, sprayers, etc., which do not apply to any other crop, but you have also got to have storage facilities. You cannot afford to sell potatoes out of the field. I want to make that statement just as broad as that, because it is said continually that potatoes should be sold from the field. You can never tell what the condition is, and you are up against the market. If the market finds it can buy from the field, it will take them at a cheap price. In a year of plenty it is perhaps well enough to sell from the field, if you have the information that you are going to get a cheap price later. That is for each man to determine. Potatoes are the expensive crop in equipment, and if you have the equipment you really ought to raise more than four or five acres. A sprayer is expensive. Of course you can get along without a planter, but it is a difficult proposition to raise potatoes commercially without a planter and without a digger. And then you have to have storage facilities. If you put potatoes in your house cellar and have to carry them out again, it is a very tiresome job. But when you raise cabbages or squashes, or some other crops, you do not have to have

a special equipment. Squashes are planted 9 feet apart in the rows, and 9 feet between the hills in the row. You can put on your spring tooth harrow or disk harrow and harrow between the rows and you have but a small piece to hoe by hand. You can get over the field very easily and take good care of the crop. But when you come to store them you certainly must be prepared to handle the crop. You cannot put squash into the market from the field and get anything at all. You must have a squash house, perfectly frost proof and you must have fires and maintain a high temperature at the beginning and 50 or 60 degrees until they are sold. And you will have to have shelves arranged for them. Of course if you had a potato cellar the room overhead would make a very nice place for the squashes. After once being equipped with a house, it seems to me there is a very good profit in raising squashes. I like the crop the best of any crop that I raise; but you must plant the right kind of seed, a hard shelled Hubbard squash that will have good keeping qualities.

With cabbage the same thing is true, as regards equipment. The tools are not expensive. The tools used for ordinary farm work will carry the crop through from beginning to end. If you raise cabbage of course you will find a place to put the dressing from your herd. You can raise cabbages on manure with a little fertilizer, but you will find the expense in the storage. They must be racked up, separate from each other, so that the air can draw through in order to have them keep until this time or a little later, if you are going to make money on them. I do not know but there are farmers who want to run a farm for a home. Of course that is our life and we want to make that life as comfortable and as entertaining as possible, but we must have the ready cash to do it, and any system of farming that produces cash in hand every year, will receive my sanction, whoever advocates it. It is the financial end of this matter that interests me and I believe it does you.

The hay crop you are prepared to handle anyway. If I were to make any suggestions in regard to raising feed for cattle, I would say this,—that I would begin in a small way with alfalfa. The question has been raised again and again in this State, year after year, Can we raise alfalfa in Maine? Now I have been experimenting with that crop for a good many years. I began with one-fourth of an acre. It came but it afterwards winter-

killed. (That was before we were told that we needed lime to raise alfalfa.) I immediately plowed the soil up and sowed it again and I got another failure but finally by studying the soil and the conditions of the crop I got a thorough understanding of alfalfa. After I had mowed it three or four years and it had winter-killed again, I decided that I would plow up the piece and dress it and lime it. I planted it to potatoes. After the potatoes came up I found a number of roots of alfalfa through the potatoes, that had survived the plowing and the harrowing. I was at that time Master of the Sagadahoc Pomona Grange. In June we had a very severe drought. I was going over to Richmond to attend the Pomona meeting, and I thought perhaps I could find an alfalfa stalk to interest the farmers. I went into the field and after finding a few plants, a dozen or so, I found one that was a good illustration of the growth of alfalfa. My soil is a heavy clay soil. After you get down a foot below where it has received any tilth it is a blue clay which would make excellent brick, almost as hard as granite. I found this root was pretty good sized at the top and seemed to go away down. I began to dig a hole, like a post hole, and I dug it back pretty well working cautiously until I had worked down around the plant to the length of the shovel handle. It was tiresome working then, and I thought I would take hold of that root and perhaps it would render a little. I took hold of it down to the ground but the root broke off. I wrapped it up and took it over to Richmond and when I called the attention of the people to the plant I unfolded it and held the crown of the plant at the head of the table and the end of the root just touched the floor.

After I took the potatoes off from that piece of ground I limed it heavily. It was only 1-4 of an acre and I could afford to stand it. Then I sowed it to alfalfa and I have mowed it for four or five years and it has been a very heavy crop every year. I have adopted the system of trying to inoculate my farm with alfalfa by growing it on the farm. I found that all of my land needed lime not only for alfalfa but for almost every crop except potatoes. Consequently after I raised potatoes I limed the soil at the rate of one ton to the acre on top next to the seed. I then sowed my grass seed and grain, the same as I would usually do, and on every acre I put ten pounds of alfalfa seed. The expense was very little compared with the

satisfaction I got from seeing whether alfalfa would grow or not, and the amount I got from that method would absolutely surprise you. There is not much risk in sowing it in that way, as if the alfalfa does not come I have ten pounds of red clover, 5 pounds of alsike, a peck of herdsgrass and 5 pounds of red-top, so the land is pretty well seeded and the alfalfa can do as it pleases. If it comes at all, the next time you seed it you will find that it will come much more readily, because I actually think there is something in this matter of inoculation. I never have bought and never shall buy soil to inoculate my land for I am going to bring it up on my own farm. If I cannot I will call it a failure and quit. I don't know as it is an absolute disgrace to make a failure of anything. There may be conditions that we do not reach. But if you are going to make a success of any crop, you have absolutely got to place yourself in a position to receive your information at first hand, you cannot take it from others, let them talk ever so intelligently or ever so eloquently about it. You will find that alfalfa kills out on clay soil very much easier than clover does, although it is so heavily rooted. When the clay freezes it will pull the top off, and when the crown is pulled off the root is gone, no matter how long it may be. Under conditions like that I very often lose my crop of red clover, but I put in the alsike and that stands the frost much better than the red clover. I expect that this winter all the alfalfa and practically all the red clover will be gone, and the pieces I have seeded down will come very much to alsike and the other grasses. Next year I shall pursue the same course. You have got to define your position and stand by it, and if you have made a wrong start, start over again.

In regard to the feeding value of alfalfa, you will find that you will prefer it even to clover. It is a very good feed. Of course I am not speaking from a scientific standpoint, but I think that alfalfa is the best crop, for feeding purposes, and next to that is clover and next to clover comes corn. If a man has a lot of clover and corn, he can pull his stock through the winter pretty comfortably with the grain he has raised, if he has tilled enough land the year preceding to occupy his time and attention.

If a farmer does not care to raise the crops I have suggested, or has not the equipment, let him adopt some other system. I do not suppose for an instant that this is the only line of crops

that can be raised profitably. Try whatever crops you choose, but as the basis of your farming keep cows, keep young stock, keep some kind of stock so that you can turn back your roughage and keep your farm up to its present state of fertility or even improve it a little. And if you raise a money crop of course you can buy fertilizer.

Ques. How much alfalfa have you ever succeeded in raising per acre?

Ans. I cut it three times a year. The first crop comes before the fourth of July. When I find a blossom here and there and find that it is beginning to head, I cut it. I try to cut it in the afternoon and let it lie over until the next day, and rake it up and bunch it. Then I let it lie three or four days, and simply shake it in the bunch. We do not stir it at all, but shake it up light and loose and let it stay until it is well made, and finally open it enough to air it. The first crop will be a tremendous crop; I do not know just how much but I cut a great deal more than I do of herdsgrass or red clover and I am pretty successful in raising both. The second crop will be materially reduced. You will probably not get more than two-thirds as much, and the third crop will be reduced from that, perhaps not quite half as much as you cut the first time. It depends very much on the season. If it is a nice summer and especially wet, and your ground is well drained, your last crop will be better than your first. On wet and heavy soil of course you will find a great deal of difficulty in carrying your alfalfa along and if you sow it without lime you will not get any satisfaction out of it. If I had a sandy or gravelly soil I would make it rich and cultivate it thoroughly and would not allow a weed to grow on that ground for two or three years and I think I could raise a tremendous crop of alfalfa. Do not try to raise it in a large way, gentlemen, do not take ten acres or five acres, but take half an acre or a quarter of an acre, and when you understand the crop and make up your mind whether you want it or not, then is the time for you to branch out. There is no doubt in my mind that the State of Maine is going to raise alfalfa. It is not coming all in a minute; we want you to get used to it, and then I think you can raise it. I do not care what your soil is, where you are raising four or five tons to the acre you have to feed that soil. You are taking the fertility out of the soil and you must put something back.

PROF. BARTLETT—I presume you do not think that we can have permanent fields, meadows of alfalfa, here in the East as they have in states farther south. You mean you would use it very much the same as you use clover and ordinarily you would not expect it to last more than two or three years. You know in the alfalfa region of the West and South a field once thoroughly established in alfalfa is good for years. Our experience has been that we are liable to get a winter every two or three, or perhaps four or five years, that alfalfa will not stand. We get that condition in which the top is broken off by the throwing of the ground. A coat of ice is formed over the surface. We have no trouble in growing alfalfa, but the trouble in keeping it is that peculiar condition, the sheet of ice forming over the surface that kills the alfalfa. The best field of alfalfa we ever had was in Aroostook County where there is a thoroughly well drained soil and the underlying soil is lime rock, the very best condition you could possibly have for alfalfa. That was heavily limed and we got a field well established and it grew for three years and then we got a winter like this one, a coat of ice formed over the surface and there were very few stalks left.

MR. GUPTILL—In regard to the continuous growth of alfalfa, I think there is this much to be taken into consideration. In the alfalfa fields of the West the chief difficulty is the lack of moisture. The root will go down until it gets moisture. Those fields do not have to be fertilized because that soil is virgin soil, and if the subsoil is rich and the roots of the alfalfa reach into the subsoil, perhaps the conditions of the soil are better and the plants would get a better growth. There is no question but that it does kill out some years in this State. One year I will have 20 acres that will be one-half alfalfa, and the next year I will have practically none at all. Of course the lime is needed anyway. Practically all the soil of Maine needs lime. While it does not furnish any plant food you will find that all of the grasses and all of the grains take hold and absolutely pay for the lime you use. So in sowing alfalfa with the other grasses all you have lost, if it does not stand, is your seed. I suppose that professional men will take exceptions to my statements. They want to raise clear alfalfa. I want to raise as much as I can. If I cannot raise it clear I will raise it mixed with red clover. I appreciate the difficulty which Prof. Bartlett

has mentioned. I know exactly how that works, in such a fall as we have had this year. It may be true that next spring I shall find my fields practically clear of alfalfa, because this fall has been an exceptionally bad fall. Still I do think it is up to every man to experiment with alfalfa.

Ques. Do your consider the silo a valuable adjunct to the farm?

Ans. The silo has been talked so much that its value has come to be a recognized fact. I place the corn crop next to alfalfa and clover, in importance, and in taking care of the corn I do not know how we could get along without the silo. Of course you should work in all your roughage and straw, unless you can get a valuable price for them. If I had nice clover hay and silage I would not feed my straw if I could get $10 a ton for it. I would sell some straw and put the money into grain, although I do not usually advocate the purchasing of much grain.

BANQUET.

A very pleasing banquet was held at the Falmouth Hotel, Portland, on Thursday evening, December 28, under the auspices of the Portland Board of Trade. Mr. Chas. F. Flagg, President of the Board of Trade, acted as toastmaster. Remarks were made by the following named gentlemen:

C. F. FLAGG.

Chairman Board of Trade.

Last night I heard one of the men who had come here talking to another, and he said, "I am going to stay through the meeting. I want to hear these lectures; I came to learn, and I want to improve my dairy methods." I believe thoroughly in this matter of attending lectures and learning how to bring our farms up to date. This morning I talked with another man who said that in many things here in Maine we are behind the times but we are studying, we are trying to improve. To me that was much more refreshing than the statement of the man who some years ago came into my office and said, "We, in the State of Maine, are the smartest people on the face of the earth, and the most honest." That man confessed to me that he had never been out of the State. The attitude of these men who have come up here to learn, the attitude of that man this morning who felt that there were many things to learn and that we were improving, was one of the most refreshing things to me, because we are getting ready to learn.

And then there is another thing that occurs to me. You may know that Commissioner Buckley is a member of our Board of Trade, and perhaps for that reason especially, he is in a position to notice the increasing interest which is being taken by boards of trade in matters connected with agriculture. A spirit of co-operation is springing up. I think perhaps this is

more evident in the city boards of trade than in the smaller boards of trade. Speaking for our own Portland Board of Trade, the spirit of co-operation with agriculture, the understanding of the agricultural needs of the State so that the city and the farm can get together, is increasing. We see many signs of that increasing interest between the boards of trade and the young men who are turning their attention to the farm. Right over here is Dr. Owen Smith, who is Secretary of the Farmers' Club of this City. Once in a while he gives a lecture on dairying himself. He can take you out to the farm and tell you exactly how much of the feed it takes to produce a quart of milk. Only a few years ago there occurred in this city a most remarkable thing. There was a young man who told his father that he wanted to go on to the farm. He had every opportunity to go into a commercial business in this city but he wanted to go into farming. His father made arrangements so that he could go on to a farm and his mother told me about it. There is Howard Randall who has gone up to Harrison and founded that farm known as the White City, and one of the most prominent lawyers of Augusta has a son who is going to be a farmer. And only the other day I was told of a manufacturer who said that his son was going into farming and he said he expected he was going to make more money out of farming than he had made in his factory, although he had done fairly well.

DR. OWEN SMITH.

If we had an assembly of farmers here, I think I could talk very understandingly to them, but there is a well established fact, following out Mendal's law, that there is a tremendous uncertainty, especially in the second and third generation, of hybrids, and it places me at a great disadvantage in talking to hybrids. The fact is that Mr. Flagg, who is a most excellent toastmaster, a most excellent president of the board of trade, a most excellent business man and a most excellent philanthropist, and who is interested in all the progressive things that go to make up a good and great city, is a mighty poor farmer. I would not want this to get out around, as he is trying to estab-

lish a reputation as a farmer; but he is a very poor farmer and I will tell you the reason why. He has had all of the good things that come from the farm but he has never paid any of the bills. He has seen all these enthusiastic business men whose sons are going to be farmers and make so much money, but as a matter of fact there is no great amount of money to be made on a farm such as we have in the State of Maine. It is a good, safe, logical reasonable business proposition for a man of small means. Mr. Burt of New York, who is probably one of the brightest government experts we have in the country, wrote up a successful New York farm, perhaps the most successful farm in the State of New York. He went into every detail of that man's whole career,—how he started with a farm that was inherited from his father, how he under-drained and tilled and brought that farm up to its highest state of cultivation, how at the present time he is employed as an expert in the State of New York advising other farmers, mostly rich men who are going to farming, and you would be amazed at the small amount of the net earnings of that farmer. Now to decry farming is not the object of my talk tonight, because farming is the backbone of all the industries of the whole world, civilized and otherwise, but the incomes are distributed among thousands and thousands and the net incomes of those individuals are comparatively small. Still, their investments are small. If we had in the State of Maine ideal conditions, as they have in the West, it would be possible to make those incomes larger, but we cannot farm in New England and with New England I would include the State of New York and perhaps Pennsylvania and Ohio even, in the same way that they do in the West, because our methods of farming must be different from those of the great western prairie reserves where things are done on a large scale. The minute that the farmer takes on more than a certain number of acres, perhaps two or three hundred at the outside, the transportation of his products, his fertilizers from his barns to his lands and his crops back into his barns and from his barns to his markets, so reduces the value of those fertilizers and crops that it becomes almost nothing. Certain efforts have been made in the past to make the Maine farmer think that he is an obect of charity and that is a great mistake. What we want to do for the Maine farmer is to reduce his

expenses. The most discouraging thing that the farmer today has to meet is the question of taxation. The Canadian people are taught today that they cannot afford to have any money in the savings bank. The money that would ordinarily be invested in their savings banks ought to be invested in their farms. If the Maine farmer makes an effort to improve his farm buildings or his plant in any way, shape or manner, his taxes come up to a ruinous rate, while his city brother invests his money in property that has to pay no taxes. Now if the city bred man wishes to be of any use to his brother farmer, his brother countryman, he has got to stop taxing him away beyond his proportion of the burden. I think that is one of the first and fundamental things that we must do. In the city we have a method of education. We teach all of our city boys to be druggists and dry goods men and lawyers and bankers and physicians, etc., but in return for the tremendous tax rate that the countryman or the farmer has to pay, we teach his boy to be exactly the same thing, whereas we should teach him to be a farmer, and to understand the first principles of chemistry, of biology, and of bacteriology, that today are so essential in the education of every farmer.

It would be the height of folly for me to go on and tell you the things, or a part of the things, that every farmer knows perfectly well. As a matter of fact the city men that are making a move—and it is a laudable move, they believe in the things they are doing—are just as far today from the needs of the farmer as they were 10, 15 or 20 years ago, before this movement set in. The things that are going to be done for the farmer are not the things that the city men are going to do for him but the things he is going to do for himself.

I thank you for inviting me to talk tonight.

MR. W. H. DAVIS,

Editor Maine Farmer.

I assure you that it is a distinct pleasure for me to be here on this occasion and have the privilege of saying a few words to this company. The toastmaster said that he was going to

bring out the talent around the table, so I suppose that I may feel complimented by being considered among the talent that is here. Perhaps it is only one talent in my case, however. I am not quite egotistical enough to think that I have all the ten. It seemed to me while Dr. Smith was talking that there was just a little note of pessimism in what he said about the Maine farmer. I cannot quite agree with him in regard to the possibilities of farming in Maine. We all know that farming in the eastern section of the country, in New England especially, on these old farms on these hills and on the few plains and valleys that we have, cannot be carried on in anything like the way it can be carried on in the western states upon those broad plains where they take three gasoline engines and haul 55 plows and plow an acre of land in four minutes. But at the same time here in New England the farmers have to make a comparatively small investment, and upon that small investment we are able to get splendid returns. The fact that the net return upon a small New England farm is comparatively small, does not, it seems to me, mitigate against the advantages of the business. The farmer who is making a few dollars clear off from his farm is carrying on a business of considerable magnitude and that few dollars clear does not represent the entire net income. He has from the products of the farm a very large part of his living, in addition to the profit on what he sells for cash. There are a great many men right around in this part of the State who are doing better than that. There are a great many comparatively small farmers who are able to buy automobiles, perhaps not every year, but they can buy an automobile and they can go to the city and go to the best hotel and enjoy themselves as well, perhaps, as the majority of people who live in the city. I do not intend to give you the idea that I think the farmer is getting wealthy off from these old New England farms, but it is a good business if it is conducted in a business-like manner, and there we come to the point of the whole matter, the point we are all trying to make in modern agricultural education,—that the farmer must adopt better business methods, he must find out the cost of things and if things are costing him too much he must reduce the cost. I presume most of you are acquainted more or less with the agitation that has been going on among the printers in the country. The farmer

needs to do just the same thing. He wants to find out just the same thing. He wants to find out just where he stands in his business. He cannot make a good business and simply depend upon the amount of money he has left in his pocket at the end of the year for his knowledge of whether he is making money from his farm or not. Those of us who are calling ourselves educators are trying to encourage the Maine farmer, and the New England farmer, to adopt business methods. Now in my own business, I do not think that our mission is so much to tell the farmer how to grow his crops as it is to encourage him in the improvement of his business. Of course one feature of the business of a farm journal is to tell the farmer how to grow crops, but the more important mission, it seems to me, is to tell him how to improve the business of farming and induce him to adopt better business methods. That is also one of the great objects of such gatherings as this Dairy Conference. The farmers who come here are encouraged not simply to improve their methods of managing their dairy and to learn how to feed their cows better, because they could get that from books. They have gotten over the time of disbelieving in book farming; but the farmers get some inspiration and encouragment to adopt the kind of business methods that the city man has adopted, by going to such gatherings as this. There are some features of the farming business that are very profitable for Maine today among those farmers who are conducting their business on business methods. You all know some of the results that have come from our orchards this year. I know of one man who has sold 250 barrels of Northern Spy apples from one acre of ground. I do not know how much he got for them all but I know he sold some for six dollars and some for five. If he averaged four dollars he made a pretty good income from that acre of ground. And he is going to get at least 250 barrels from that acre every year. The good orchardist has gotten over the belief that there is an off year in apple growing. Another man told me a few days ago that he picked 33 barrels of fancy apples from an acre and a half of ground; and there is at least one man in the State who has sold $15,000 dollars worth of apples out of his orchard this year. And there are a good many who have sold just a few barrels of apples. We all know that there are a great many orchards in Maine that are not bearing a

quarter part the amount they should, but the farmers of Maine are waking up. The men who are awake are scattered all over the State and their influence is gradually leavening the whole lump; and I think the young men, especially, are becoming alive to the opportunity that the State offers.

HON. CHARLES STROUT.

I have not even the claim to recognition as a farmer that Dr. Smith has given. He is one of our most expert men in his line of business here and we all look to him with a great deal of confidence in the most difficult cases; and yet he has told you to-night, not in so many words but inferentially, that he is one of the best, the noblest martyrs to farming we ever met. We have Socrates, who was a martyr to the ideal, Napoleon, who was a maytyr to the warrior spirit, and Lincoln, who was a martyr to duty and to mankind. But the Doctor stands among them all as a martyr to farming. He may not go down to history as those illustrious personages have, but he tells us frankly here that he works all day and collects those expert fees which are well earned and then he takes them out to his farm in Sebago and puts them into his farm and leaves them all there; and when he comes to study up the net profit he has to come back here and go to work again.

I think it must be admitted by all of us that meetings like this are productive of good. The future is to be made for us by devoted men who can stand up and express their ideas and fight for those ideas against obstacles. A snow ball grows by rolling and it is by the work of these men who are earnest and steadfast and devoted that development comes in dairy farming and in general farming; so that even from this small meeting you can look for satisfactory fruit, and future developments. I am no prophet, but we will say in ten years from now, or sooner, I hope this meeting will be repeated in this hall, with a hall filled with enthusiastic dairymen who will come here to learn something from their fellows and to forward their life work. In that way we shall develop the State of Maine and the city of Portland, and make us a better commonwealth, and

put Maine where she ought to be as a farming community, and show the western farmers that what we lack in capital and what we lack possibly in enterprise, we can make up by dint of forcible work and scientific application. And these are the men here who can do that, who are competent to do it, and while they have got no inspiration from Prseident Flagg and myself as to methods, still they will go away with the feeling that this hour has not been wasted and that they are better fitted for their work through having had this opportunity.

J. C. CONNORS.

Like the last speaker, I shall have to plead ignorance of dairy methods of farming, because I was born and raised in the city and the only farm we ever saw was on a picnic. When the picnic organization of the ward would take all the boys in the ward out in the country once in a while, we would see a cow.

While eating this banquet to-night I was reminded of last Thanksgiving. I happened to be in New York City with the Commissioner of Weights and Measures and we were in some of the markets where they were selling turkeys. We looked in the boxes where they trimmed the turkeys, in two or three of the stores, and knowing a little about it we looked at the heads of the turkeys. They have a practice there of taking a piece of lead weighing 3-4 of a pound and sticking it down the neck of the turkey; when they put the turkey on the scales of course that lead will be there, but when the turkey is dressed the neck is cut off just below the lead. The customer really paid for about 3-4 of a pound of lead. That is only one of the ways that they have in the City of New York for cheating the consumer. They have some methods there, on account of competition being so keen, that I hardly think are practiced in some of the other cities. I worked in New York City with the Weights and Measures force a good part of last year. Up to 1910 there wasn't very much done in that city in regard to regulating the weights and measures, so that when Mayor Gaynor instructed the force to get out and clean up the city they found some interesting things. The force consisted of 20

men, and the regular procedure was for the 20 men and two or three wagons to go down through the markets, or through the east side and take in all the incorrect measuring and weighing devices found in use. The east side is largely a push cart district; about everything is sold from push carts. You can buy all kinds of food and dry goods from push carts down there. They are so close together that it would be impossible to walk along the street unless you went up the crossing. The force there would go to a block and ten men would go around on one side of the block and ten men on the other side and work together, simply taking from all the dealers the incorrect weighing and measuring devices found in use. The first thing a tip would be sent along up through the street that the weights and measures people were coming, and then there would be a grand scramble to get out of the way or hide everything possible, or to take the push cart and get away. Sometimes there would be a dozen push carts all piled up in a general heap, dealers running with their scales and measures and trying to hide them. I went after a man one day and he ran into a house and opened the door of the oven and put the scale right in there. Of course we took him to the Station. We found another man just walking away from a dry goods cart. He was walking rather stiffly, as though he had a stiff leg. I said, "Where is your yard measure?" He said, "I haven't any." We searched and found that he had taken the yard measure and put it down the side of his trousers, and when we found that measure we found that he had sawed two inches out the middle and dovetailed it together so from 22 there was nothing until you reached 25 inches. It was a very good job and you would hardly notice it unless you looked it over very closely. But that is contrary to the general rule. When the dealers want to alter their scales or weights they usually adopt some pretty rude methods, such as hanging a piece of iron on the scales. Some of them use a good deal of ingenuity in altering their weights and measures. We found out from the bakers, who in some cases were compelled to deliver loaves of bread to the people, that they were making up two kinds of loaves. One they sold in the store, and the light one they delivered at the house. If you ordered a loaf of bread, or a couple of loaves, on the telephone, they would bring up the light loaves; but if you sent down to the store they would give you fair value for your money.

The United States has been more backward in adopting legislation regarding weights and measures than any other country on the Globe. Even in Japan the regulations are way ahead of ours. Their laws are stricter in regard to the use of false instruments, also against short weights. It is the same in Canada. In a few of the states some laws have recently been passed. In New Jersey the legislation provides that anybody who sells or offers for sale any instrument that is not correct is liable to a fine of $100. There are a great many instruments offered for sale throughout the United States that are not correct and are advertised as not being correct. It was only a short time ago that a circular was sent out over the United States advertising a certain make of scales, and it was stated in the circular that by using those scales you could buy 30 pounds of pork loin and retail it at the same price. You couldn't do it on any other scales but you could do it on those. That is one of the reasons that these different laws are being passed, together with the amount of short weight that is being given in the various trade customs that have sprung up throughout the country. A man starts giving short weight in some form or other and then somebody else adopts this custom because he likes it and somebody else adopts it because he is driven to it by unfair competition, and it is called a trade custom. About every dry goods house in New York, up to last year, was overmarking sheets and tapestries. If a sheet was marked 80 x 92 it was very probably 72 x 80, and so on. And when that was called to their attention, they said that was a trade custom, and it couldn't be stopped. The way they did finally stop it was this: The most of those articles were imported and they found a law in the United States Custom House that no overmarked goods should be brought in; consequently eight or nine of the dry goods houses had to employ an army of men to go down and remeasure and remark the goods.

As a matter of fact, all through the United States there is a revival going on now, in weights and measures. The different authorities and the public are waking up and want to know why they cannot get 16 ounces for a pound at all times, and some of the states are passing very rigid laws on these lines. In the last session of the legislature Mr. Buckley was made the sealer of weights and measures and I know he will do every-

thing in his power in this matter. As a matter of fact there is no law on the statute book which provides a penalty for the giving of short weight. The offender might be proceeded against under other sections of the law, but there is no statute which provides a penalty for this special offense. I hope that some time in the future Maine will come up to the forefront. I know Commissioner Buckley will do all in his power to give the citizens of Maine full weight and full measure.

PROF. J. M. BARTLETT.

I have been very much interested in the remarks made here. Of course one of the objects of the Experiment Station has been to provide means for the farmers to purchase food more cheaply. I have been thinking since I came to this banquet that if such a banquet as that could be furnished for the price asked, the Station has accomplished its mission in that particular.

The Station has done quite a little in regard to short weights and measures, also in relation to the matter of pure food and drugs. When we began this work of inspection, some six or eight years ago, we found conditions in certain lines pretty bad; but of late years, and particularly in the last two years, we have found a great improvement in the materials that we have inspected. For instance, take oysters. Perhaps you may not know the custom that used to prevail in regard to oysters. They used to be treated in such a way that they would absorb water. They were taken from the salt water and soaked in fresh water and they would absorb a great deal of water. Then the oysters were kept in cans and ice put right in the cans, and when a pint of oysters was measured out the liquid and the oysters were taken together. As a matter of fact the customers then were buying more than 25 per cent of water, and sometimes we could drain out 40 per cent of water. But there has been a great improvement since we have taken the matter up with the dealers and threatened to treat them severely if they did not remedy conditions. This last year in the inspection we found very few oysters that carried more than the allowed amount of liquids. In fact, when you buy a quart of oysters now, you get almost

solid meat. So while we have to pay a little more for oysters than we used to, they are worth 25 per cent more than they were; and not only do you get more oysters but you are surer of the quality. When they were taken from the salt water and soaked in fresh water, you could not be sure of what you were getting. Oysters are the greatest germ carriers of any food, next to milk. A great many cases of typhoid fever have been traced to oysters. Another thing in which the improvement has been very noticeable is in the branding of different articles that are sold. When we first inspected molasses, everything that sold under the name was branded molasses. Now anything that is marked molasses is usually pure molasses. In our last inspection I do not think we found even one sample that was not pure molasses. Of course the mixtures of glucose and molasses are still sold, but they are properly marked. If the consumer takes the pains to look at the label on the jug or package in which he gets the molasses he will find that it is properly labelled. There is another line of goods which we inspect and with which we have considerable trouble, and that is the extracts. With those it is almost impossible to get full measure, except from the very best companies. The extracts have been sold for so many years in bottles which the manufacturers claim to be two ounce or four ounce bottles and are perhaps anywhere from 15 to 25 per cent short, that it is difficult to change this custom. The manufacturers of the Miller extracts, for instance, say they cannot sell a ten cent bottle now, under the restrictions that we put upon them, because they have to put so much in a bottle. They used to sell a two ounce bottle for ten cents, or what they called a two ounce bottle. They get around the difficulty now sometimes by using a bottle that is as large as a two ounce bottle but much thinner. It does not hold much over an ounce and they do not mark it as containing two ounces and so we have no case against them. The consumer should see what he is getting, and the quantity should be marked on the package.

S. C. THOMPSON.

I am very glad to have the opportunity of attending this banquet. It seems very much like coming home for me. I was

born in the State of Maine and lived here until five years ago, and it is always a pleasure to get back to this State. I feel that the State of Maine has some opportunities that even her own citizens are overlooking. And in the few words that I shall say tonight I would like to express my idea of the line of work that I think ought to be taken up. I am satisfied that the time has come when the State of Maine needs more advertising, and broader advertising, than it has ever received. We may be unfortunately located, up in the northeast corner of this country, and it is a fact, I am sure, that we are not always able to make ourselves heard in that part of the country that we ought to reach. I believe that the State of Maine has some opportunities, particularly in dairying, in fruit raising, and in potato raising, that are a credit to this or any other state in the Union. If we will just advertise, and I am not going to leave it with the word advertising—we have had already too much advertising of some kinds. The fact is, if you get out in the Middle West the people hardly know Maine except as a fishing state. That kind of advertising we have had too much of, and the kind we want now is the boom kind. I believe we have opportunities here that will compare favorably with those so broadly advertised in the extreme West. In the five years that I have been out of the State I have visited almost every other state in the Union and I have come to the conclusion that a little advertising, a little printers' ink used properly, will attract the attention of people who are looking for something better than they are getting today. The people of the Middle West, on those broad prairie farms, are not altogether satisfied with their lot. They are being attracted by the glaring headlines of advertisements from the extreme West, perhaps Oregon or Washington, in fruit culture. I had occasion less than a month ago to hear the question of Oregon fruit discussed. I heard a man who was thoroughly familiar with the subject say that in one section widely advertised the trees were usually planted in holes blasted out of ledges and they depended on the suckers from the East to come out there and buy that land for $500 an acre. They are all co-operating and working for one purpose and that is to get people to go there. I believe the State of Maine, through its Department of Agriculture, through its Dairymen's Association, through its various commercial clubs, by working together, by doing the kind of advertising that will reach the class of

people that are seeking for a change, can direct those people who are farming on land worth from $100 to $200 per acre and give them something that has value in it. I believe that your conventions, your exhibits of butter and milk products, as well as your fruit and your potatoes, will aid in this work; that the money can be well expended in that direction; but do not stop there. Have the reports of those meetings, the results that have been accomplished in the State of Maine, distributed so widely and so generally that the people everywhere will be attracted by what is said. When you advertise persistently enough you are bound to attract those people and that is what I believe we need in this State,—more practical farmers.

I am not saying anything that will discourage the city farmers in any way. They are doing a good work and Maine is being developed. I have watched the development of Maine with a great deal of satisfaction. But I believe what we want now is some of the progressive men, men who will work their farms, men who are practical farmers. If we can get them into the State of Maine and get them interested in some of our propositions, then the value of our lands will increase, as I believe they ought and those people will be better satisfied than to go to the far West. Prof. Henry, Dean of the College of Agriculture of Wisconsin for a great many years, made the statement that he knew of no better place for a man to buy land for farming purposes than in New England; and he backed up his assertion by coming to New England and buying a farm which he is working very profitably. The State of Maine has been too long conservative. We have seen some of our most progressive young men, in generations past, go to the West. We have let them go and the farmer has been satisfied with a good comfortable living. Now if we will just tell those people who have gone what they have left, and show them their opportunities, I believe they will be glad to come back to us, and I believe they will be benefited and we will be benefited by their doing so.

PROF F. RASMUSSEN.

I am fully in accord with what Mr. Thompson has said, because if there is anything I believe in, it is the fact that we

ought to advertise New England. The State of New Hampshire is in exactly the same position as the State of Maine. New Hampshire has been advertised as a place for mountains and pure air and lakes; and I believe it is also a good place for a man to make a living if he goes at it in the right way. I want to say to you, Ladies and Gentlemen, that I am glad to be here. I have been excellently treated while I have been here. I want to congratulate the Board of Trade of this city on the stand they are taking to promote agriculture because I firmly believe that it is as important for the city to help develop the country as for the country to help develop the city. A good many years ago when the cities were small and depended for their trade upon the surrounding country, every small city and town realized the importance of having a prosperous agricultural community. As the cities grew they felt the need of that less. We can sit down to a table now and get our oranges from California, our beef from the Middle West, our cheese from Wisconsin and our butter from Iowa. We are not depending upon the surrounding country. We have not felt the need of a prosperous agricultural population; but we must realize that about forty per cent of all the articles manufactured in this country come from the farm. We must also realize that 72 per cent of the country's export is agricultural products. Every city man ought to realize that the development of agriculture means a great deal for him. For instance, the Department of Agriculture at Washington spends a million dollars in fighting some of the insect pests of the South that kill out the cotton crop. That not only helps the farmers of the South but it helps the milling industry of the East; it helps manufactures; it helps commerce and trade. Our shoe industry, which is great in New England, is dependent upon the hides from the western country, to a large extent, and anything that is done to develop the cattle industry in the West is a help to manufacture, commerce and trade in the East. It is a great puzzle with some people how the city can help the farmer, but it can help him in a number of ways. It can help him by working through the legislature for larger appropriations for agricultural development,—the development of an agricultural college, an agricultural high school and other schools of the State. Not only that, but I think that one of the greatest things the city people can do is to be in sympathy with agriculture, to get the view point of the farmer,

to see the difficulties that the farmer of today has to struggle with. If they do not have an appreciation of that I feel that the work will be somewhat like charity work in the cities. The city gives money to be expended and takes no particular interest in the way it is expended.

I thoroughly believe in what the Editor of the Maine Farmer said about better business methods in farming. If we have better business methods on the farm we will get a better living on the farm; and the farmers need to have faith in their own business, and that is what 60 or 75 per cent of the farmers in New England do not have. If you go out and talk to a farmer and ask him what it costs to produce a quart of milk or raise a bushel of corn, he says he does not know and he is not willing to try to find out. A man like that you can never give much assistance. He must first appreciate that it is important for him to study the details of his business. Self help is the most important help that we can have. If we can instill into the farmers some ideas to work out themselves, that is all we can hope for.

J. P. BUCKLEY.

The last banquet I attended in this hall was a very interesting one to me. It was last March,—the annual banquet of the Portland Board of Trade. What pleased me and interested me most in the addresses that evening, was the thought in regard to the agricultural development of our State, that Mr. Thompson has so clearly brought out tonight. As he spoke of coming across the country and seeing what they were doing in other states and how we are in the background, it reminded me of the time, some 30 years ago, when I was in Detroit, Michigan. We had representatives from New Orleans to Canada, and from Maine to California. My partner and I had been out rowing and when we came in a gentleman from the far West wanted to know what Club we represented. We told him the Portland Boat Club. He wanted to know if it was Portland, Oregon. We said, "Portland, Maine." He looked us all over and then made the remark,—"You are from way down in Maine where they raise the sun with a crowbar." That is the opinion they have all over the country and we have got to show them what

Maine can do, and we cannot show them unless we can get down to business. We must send our apples out in proper packages. We cannot send them with a dozen good apples on top and the rest of inferior quality. It was a surprising thing, at our horticultural meeting, to learn that a man had gone to Boston and bought a barrel of choice Maine Baldwins, and shipped them down to Augusta, and when he opened the barrel it contained hardly ten per cent of choice apples. If a barrel of those apples should be opened in Chicago or London, it would not help out the reputation of Maine apples. We want barrels going over there with "Maine" branded on them to be filled with apples that will be creditable to Maine. They had an exhibit up there in Boston and seemed to want to develop the plate business. I cut the most of those prizes out. I said, "We are not selling our apples in plates. We have got to teach our fruit growers to put them up in packages." The West hasn't got any better apples than we have; they cannot get the flavor.

Another thing came to my attention in Boston a few weeks ago. The Secretary of the Massachusetts Board of Agriculture had seven or eight Wealthy apples on his desk, highly colored. Secretary Martin from Vermont said, "Can you color apples like that down in Maine?" I said, "The same sun shines in Maine that shines in Massachusetts, only it shines in Maine before it shines in Massachusetts.

The more meetings we have with boards of trade, to get our farmers and orchard men down to business principles, the quicker we will develop Maine.

I want to thank you, gentlemen, for the courtesy that this Board of Trade has extended to the Dairymen's Association. There was a question about going to Portland or Norway. I said, Portland is the place. We have the accommodations and the facilities, and our dairy interests are too large to go to any small place. If the boards of trade in other places are able to entertain us as well as the Portland Board of Trade, there will be no trouble but that they will be successful along the line of agriculture.

INCREASED PRODUCTION IN THE DAIRY HERD.

By FRED RASMUSSEN, Professor of Dairying, New Hampshire Agricultural College.

Operating a dairy farm is just as much a business proposition as operating a department store. The dairy farm should return interest on the value of the land and all its equipment and pay wages for every day's labor put into it, whether done by the owner, his family or others.

It is very difficult to make a statement as to how much milk a cow should give to be profitable, as prices of dairy products vary so widely. From data collected by the Experiment Station on the cost of feeding, and a conservative estimate on the investment and labor, it would seem that 6000 lbs. per cow valued at 3.5 cts. wholesale per quart should be our minimum standard. Statistics show that the average production for New Hampshire is 4224 lbs. of milk per year.

Seemingly our farmers have been losing money on their dairy cows. This can only be understood, however, in the sense that they have not obtained market value for their raw material raised on the farm marketed through the dairy cow. Yet many such men have made a living and some have accumulated a bank account. A close examination of the account will not show an amount equal to the interest on the investment and the compensation the farmer and his family should receive for their labor.

It is therefore essential that the dairymen of the State turn their attention and direct their efforts toward increasing the production of the dairy cow, which can be done by intelligent breeding and weeding and by proper feeding and care.

Travelling through the State of Maine, one is struck by the lack of uniformity of dairy cattle. This lack of uniformity in the dairy cattle in Maine is due to a lack of purpose in breeding and a failure on the part of the farmer to carefully consider

and stick to the breed which is best adapted to his condition. Some grade cows are better producers than some pure bred cows but it does not follow that grade cows as a class are better producers than pure bred cows.

To increase the production of a dairy herd the owner must first of all decide upon a particular breed. If he expects to make the profit from his herd through the sale of dairy products and dairy stock his choice should be one of the four dairy breeds, Holstein, Ayrshire, Guernsey or Jersey. He should select the breed which he likes best and which is best adapted to his conditions, taking into consideration the general conditions of his farm, and the market for his products, whether he wishes to sell milk, cream or butter. If he expects to sell dairy stock he should also consider the demand for and adaptability of the breed selected for the section of the country in which he is located. A pure bred registered bull should be placed at the head of the herd. Without doubt the many grades and cross bred bulls found in Maine are in a large measure responsible for the low average production of the Maine cow. Statistics gathered from 110 farms in New Hampshire, showed that only 30 or 27.3% had pure bred bulls, and doubtless a similar condition prevails in Maine. Not only grades of dairy breeds were found but also grade bulls of beef breeds were found heading herds producing market milk. Such practices will never increase production. We must not lose sight of the specific work an animal is to do. It can no more be expected to raise good trotting horses by breeding to draft stallions than it can be expected to raise good producing dairy cows by breeding to beef bulls. The greatest, most rapid, and cheapest improvement in Maine dairy herds and increase in production cannot come through the buying of high priced dairy cows but through the purchase of bulls of dairy breeds with dairy qualities. A good pure bred bull used on grade cows is sure to give improvement, as the strong characters of the pure bred bull will predominate in the offspring much more than the weaker blood of the grade cow.

The fact that a pure bred animal is registered and has a pedigree is not always a guarantee of excellence. A pedigree is a family history often of several generations. The real value in buying a pure bred animal lies in the fact that it gives an opportunity to study each individual which has contributed to the

characters of an animal in question. The influence of one individual seldom exceeds 50% while the other 50% in the offspring is accounted for by the preceding five or six generations. In buying a pure bred dairy bull, therefore, all the information possible in regard to the production of the ancestry should be obtained and it is especially desirable that the dam and grand dam on the sire side should be good producers.

The quality of the milk as well as the quantity should be considered. Quantity can often be increased by feeding but an increase in quality must come through selection and breeding. Further, in selecting the bull the buyer should consider individuality,—his conformation, and especially the constitution and capacity of the cows. Cows of great producing power must be able to endure the work, and it is not uncommon that lack of constitution in dairy herds has been due to mating animals which had similar constitutional weakness.

FEEDING.

Some men conceive the erroneous idea that pure bred animals should give great quantities of milk and butter fat just because they are pure bred and registered. No animal, whether a pure bred or a scrub, will produce milk profitably, without the proper feed and care. Good liberal feeding is as essential to increase the production of the dairy cattle in Maine as good breeding. In fact many so called unprofitable cows can be made profitable by more intelligent feeding.

With the present high prices of feed stuffs we must practice economy in feeding. Economy in feeding does not mean to be stingy with the cows and give them less food, but to carefully select the foods which supply the necessary elements the cheapest, especially the protein. One kind of feed at $1.40 per 100 lbs. may be a much more expensive feed to use than another at $1.60. A comparison of the value of a feed can be made only when both the price and the composition are known. In many of our so-called mixed feeds, although they cost less per 100 lbs., we pay a higher price for the protein than we do in our standard mill feeds such as cottonseed, gluten, and bran.

Selecting a suitable and profitable ration for the herd is a vital problem before the dairymen. First of all it must be clearly understood that a cow is given food and in return is ex-

pected to produce milk. Milk contains definite quantities of water, proteids, fat, sugar and ash. The cow, therefore, must be given food containing these elements or food from which such elements can be manufactured. It is necessary to study the nutritive value of the different feeds and try to feed the cows so as to supply the elements needed for the manufacturing of the milk and the elements necessary to sustain the cow. A ration for the dairy cow should not only contain the necessary elements for producing milk but should be palatable, succulent and made up of a variety of feeds.

Having selected the necessary feed stuffs, the question is how much to feed. A common mistake is not to feed enough. It takes from 35 to 60% of the amount of food consumed by the cow for her maintenance ration. As a cow's feed is increased above her maintenance ration there will be a corresponding daily increase in the amount of milk and in the profit until a point is reached where additional grain will give no increase in the milk flow. The cow has then reached her limit of production and is receiving more grain than she can digest and assimilate and convert into milk. A cow gives the greatest profit when she is fed to the limit of her economic production which can only be ascertained by a careful comparison of the amount of food consumed and the amount of milk produced.

An increase in production from feeding is not obtained alone by the proper feeding of the cow for milk production, but includes also the proper feeding of the calf from the time it is born until the time of its first calf. A calf and heifer should be fed with the end in view of developing tendencies for milk production. They should be fed liberally on foods that will produce maximum growth and develop capacity but not have a tendency to fatten the animal.

KEEPING OF RECORDS.

A systematic keeping of records of the individual cows in the herd is absolutely essential in the dairy business. To know if a cow is profitable or not, records should be kept of the following:

1. The total amount of milk produced in a year.
2. The total amount of fat produced in a year.
3. The amount of food consumed yearly.
4. The economic use made of the food.

IMPROVEMENT IN A HERD IN PRODUCTION OF MILK AND FAT.

The following records of a herd over a period of eleven years show clearly the improvement in the production due to a systematic keeping of records.

Average production of a dairy herd for a period of eleven years:

Year.	Pounds of milk.	Percent of fat.	Pounds of fat.
1895	5,073	3.19	161.8
1896	5,994	3.18	190.6
1897	6,401	3.08	197.2
1898	6,504	3.25	211.4
1899	7,329	3.36	246.3
1900	6,124	3.48	213.1
1901	6,850	3.32	227.4
1904	7,950	3.39	269.5
1905	8,447	3.38	285.5

In a period of eleven years there was an increase of 3410 lbs. of milk or 67%. The increase in the amount of fat was still greater, averaging 123.7 lbs. of fat or 76.5%. The per cent of fat in the milk was raised from 3.19% to 3.38%, an increase of .19%. It pays to keep records.

A COMPLETE RECORD OF PRODUCTION AND COST.

A Profitable Cow.

Lbs. milk.	Lbs. fat.	Value of milk.	Cost rough.	Cost grain.	Feed cost.	Profit.	Cost per can.	Return of $1.00 feed.
9,775	351.2	$173 09	$34 12	$44 67	$78 79	$94 30	14.6 cts.	$2 19

An Unprofitable Cow.

Fresh January 10th.

3,768	182.7	66 97	30 98	21 74	52 72	14 25	25.5 cts.	1 27

Difference.

6,007	168.5	106 12	3 14	22 93	26 07	80 05	10.9 cts.	

The two cows were fresh at the same time, receiving the same treatment. The unprofitable cow lacked the capacity for handling feed and the tendency for producing milk.

IMPROVEMENT IN A NEW HAMPSHIRE HERD IN PRODUCTION OF MILK.

Hundreds of illustrations can be given showing a yearly increase in the production of milk and butter fat in herds where weighing and testing have been carried out systematically. The following is an illustration of the increase in milk production in a New Hampshire herd.

Year.	No. cow.	Average production per cow.	Increase per cow.
1905	27	5,215	–
1906	26	5,758	543
1907	26	6,221	563
1908	25	6,652	331
1909	27	6,827	175

The increase in production in five years was 1612 pounds or sixty-one cans of milk per cow.

The poorest cows are gradually being replaced by heifers raised from the best pure bred cows in the herd. The cows are fed a liberal ration of grain, succulent food and hay.

It is simply a repetition of what has been, and can be done by liberal feeding, by keeping records and by raising and selecting your heifers to be used in the replacing of the poorer producers.

In speaking of the value of keeping records the owner of the herd stated that he would not think of keeping cows without keeping records and having his cows tested, as it not only told him by the end of the year the amount each cow in the herd produced, but the daily records were also an incentive for the milker to do more thorough milking. Furthermore, the daily records were an excellent guide for feeding the cows according to their production.

The satisfaction and value of knowing the production of each cow in the herd is worth many times the time spent in keeping records.

DIRT AND ITS RELATION TO BACTERIA IN MILK.

H. D. EVANS, Director, State Laboratory of Hygiene.

Milk, as one of the earliest and most used of our foods, was one of the earliest to be adulterated. That adulteration has continued down to the present day. Laws relating to the adulteration of milk antedate all other of our food laws; yet it is a striking fact that the form of adulteration which has the greatest effect on the health of the users of milk, has but recently come into its deserved prominence. A substance may be said to be adulterated either when there has been abstracted from it some natural constituent, either wholly or in part; or when there has been added to it some foreign substance, irrespective of its nature.

Thus we have, for years, recognized milk as being adulterated when it has been skimmed, or watered, or colored, or thickened, or preserved, or when any combinations of these forms of single adulteration have been practiced; but we have, until recently, failed to recognize a form of adulteration of the second class, that is more far-reaching in its effects on health than all of the other forms combined. I refer to the bacterial adulteration of milk through the carrying agency of dirt.

If a food is adulterated when any foreign substance is added to it,—and this is a definition recognized by all of our state laws—then the presence of dirt in a milk constitutes an adulteration, just as much as does added water, or a preservative, or a coloring agent. This fact has been recognized by the courts of at least one state within the last year. The same statement will apply to the presence of bacteria in milk, but, owing to the fact that it is a practical impossibility to exclude all bacteria from milk, it is best to consider the two forms of adulteration of milk, by dirt and by bacteria, in their relation to each other.

In my paper before this Association last year I took up in considerable detail the general subject of bacteria, and so shall

not touch upon this part of the subject, save to repeat that the enormous multiplying capacity of these minute organisms makes them the source of financial loss to the milk producer through the production of odors, colors, and ropy and stringy conditions, and through souring; and of great economic loss to the community through the transmission of infectious diseases, such as typhoid fever, diphtheria, scarlet fever, so-called "summer complaint" or infantile diarrhoea, and many others. During the last thirty-five years over 500 outbreaks of epidemic disease have been definitely traced to the use of milk that has been adulterated by bacteria of these specific diseases. Prof. Washburn, in the Report of the Agricultural Department of Massachusetts for 1910, mentions 317 outbreaks of typhoid fever, 125 outbreaks of scarlet fever, and 58 outbreaks of diphtheria due to the use of contaminated milk, and this does not include the entire list. The question of dealing with this form of adulteration is, therefore, of the greatest importance.

First of all it is to be noted that the bacteria causing all of these numerous forms of trouble in milk, are introduced into the milk after it leaves the cow, with the possible exception of scarlet fever. In other words, the cow gives a milk that, except in the case of the cow with the tuberculous udder, is a pure and healthful milk in the great majority of cases; and so the harmful organisms are introduced either through carelessness or ignorance. Owing to their lightness the majority of bacteria enter the milk attached to dirt of some kind; so that a study of the kinds and sources of dirt that may enter a milk, affords the best index of the pollution of milk by bacteria.

Bad milk is due to the cow, to the air, or to bacteria. The first point in the production of healthful milk is the healthy cow; a cow free from tuberculosis or udder inflammation, and in good general health. This should be an axiom in dealing with pure milk. A cow with udder inflammation, due to tuberculosis or to pus forming organisms, cannot give a healthful milk. The milk from such an udder will contain the germs which cause this condition in the cow, and will set up corresponding conditions in the user of the raw milk. In addition, a cow in a run-down condition, either through insufficient feeding or through poor feeding, will give a milk which is poor in quality, and which will often have disagreeable odors and tastes. A healthy cow, fed upon sufficient good food, must be our

starting point in the production of a clean and bacterially good milk.

It is also well known that bad air in the stable or in the milk room will often cause odors and tastes in milk. Along with our healthy cow must go a well ventilated stable and milk room, if we are to obtain a milk that is satisfactory, entirely aside from a milk that is bacterially satisfactory.

But the greatest source both of trouble and danger in milk comes from the presence in it of bacteria that have been introduced after the milk has left the cow. We all accept the fact that souring of milk is caused by the multiplication of acid forming bacteria, that gain entrance to it after it has left the cow. This is a source of much financial loss to the producer and consumer. That it can be avoided is well shown by the fact that we have recorded instances of milk keeping for from three to seven weeks, when the only precautions taken with it have been to see that it was clean, bacterially, when it entered the milking pails, and that it was kept cool afterwards, so as to prevent any multiplication of the few bacteria whose introduction could not be avoided. In like manner cream has been kept sweet for periods as long as four weeks, with only like precautions.

How do bacteria enter a milk from a healthy cow? They enter in innumerable ways, but the following are the most important. They enter the milk during the milking process with the solid dirt and dust, that fall from the body of the cow, from the hands and persons of the milkers, from the dust of the stables, and from the dirt, whether physical or bacterial, that may be contained in the pails in which the milk is collected. They enter the milk during the process of handling, in the milk room or in the distributing station, from the vessels used with the milk, from the persons of those who handle the milk, from the dust in the air, from the flies in the room, and from dirt falling from the upper shelves. The more times the milk is handled, the more the chances of contamination of the milk. Briefly, dirt from cow, air, attendants and flies constitute the sources of danger to milk.

Every particle of dust is loaded with bacteria, whether this be the dust of the stable, milk room, or the open air. The hair and dandruff of the cow are covered with manure, every finest particle of which is loaded with intestinal bacteria from the

animal, as well as with the acid forming bacteria, that are ever present in a stable. Dust from the hay carries molds in addition. Dirt from the hands of the milker carries bacteria from everything that the milker has handled since washing, and, if he is not in good health or has infectious disease, the dirt carries these specific bacteria into the milk. The milk pails, if they are not scalded before use and dried in a clean place, will contain many acid forming bacteria in the uneven seams, which have come from the previous milkings; and, if they have been washed in polluted water, they may carry the germs of infectious disease. All of these bacteria, once they have entered the milk, find favoring conditions for growth and multiplication. Unless the milk is pasteurized, all that can be done, after the bacteria have entered it, is to keep down their multiplication by keeping the milk cold. Once refrigeration is removed they begin to multiply, and will cause souring or disease as the case may be.

The intestinal bacteria from the cow are the cause of most of the infantile diarrhœas and colics, classed as "summer complaint." If the cow have intestinal tuberculosis these bacteria will be eliminated in the fecal matters, and may thus find their way into the milk with the manure dust, during milking. If the milker or the handler of the milk be an incubation case of typhoid fever, or a walking case, or a convalescent case, or if he have tuberculosis or any other infectious disease, he is almost sure to infect the milk, with the production of an epidemic of the disease on the milk route.

How great is this latter danger is shown by an editorial in the New Orleans "Picayune" for Nov. 3, 1911, in which it is stated that, since the necessity of protection of our public water supplies has been recognized, in our cities for every case of infectious disease due to water ten cases are caused by infected milk.

The bacteria from the above mentioned sources can be excluded from the milk, wholly or in large part. Disease bacteria can be entirely excluded. In the first place we must, as before stated, have an absolutely healthy cow as the source of our supply. Next we must have entirely healthy persons to handle the milk, which is to be obtained from such a cow. A person who is ill, however mildly, with infectious disease, or who is in attendance on a case of such disease, and who in any way

handles milk under such conditions, is in the same class as the man who shoots you, or who puts poison into your food. Once we get milk from a healthy cow, milked by a healthy person, we get a milk which, aside from diarrhœas produced by the normal intestinal bacteria of the cow, will not cause disease.

With the cow and the persons who handle milk eliminated as sources of infectious disease, our problem is to exclude from the milk the dirt and bacteria that may enter it from the dust, manure, air and flies.

The first step to be taken is to look to our stables. If the cow be allowed to lie in her manure we must expect dried flakes of this substance to be found upon her udder and flanks. If the manure and urine be allowed to accumulate at all in the stable we must expect to find dried particles of it floating in the air, into which it is thrown by every motion of the cow or milker. If the walls and ceilings are covered with cobwebs we must expect every current of air to shake down from them dust, which will be loaded with dirt from the cow, from the floor and from the hay. If hay is pitched down to the cow immediately before milking we must expect the dust and chaff, loaded with bacteria from the hay, to fall into the milk.

If the cow be milked in the condition in which she rises from her bed, without having her sides and flanks brushed down, or her udder wiped off, we must expect dried manure and floor dirt to fall into the milk, as it cannot help being shaken off from her with every motion of her body or tail, and by every motion of the milker. If this man does his milking—and he usually does—in the clothes in which he has done the feeding of the cattle and the cleaning out of the stalls, we must expect practically the same kind of dirt to fall from his hands and clothes, as will fall from the cow herself. Ths dirt carries upon itself the intestinal bacteria from the cow, which will set up diarrhœal disturbances in the users of the raw milk; and also carries those acid forming bacteria, which are always present in stable air, and which will cause souring of the milk. Moulds from the hay may here enter, to cause later trouble.

If we wish to bring clean milk from the stable we must have clean stables, and clean milkers. I do not mean that we must have stables as clean as the rooms of our homes, but they must be free from the forms of filth above mentioned. The cow must be brushed down long enough before milking to allow all dust

to settle. The manure and bedding must be removed an equal time before milking. Feeding must be done long enough before milking to allow all dust from the hay to settle. The cow's udder must be wiped off with a moist cloth. The walls of the stall must be kept swept down, so as to keep them free from cobwebs, and the milker should wear a special suit for his work, and should work with clean hands. If a special stall can be used for the milking so much the better, but even without it milk can be obtained which is free from visible dirt. As a further precaution a milk pail with a small mouth, and provided with a fine cloth or cotton strainer, should always be used. This should prevent the entrance of visible dirt into the milk, but it is to be remembered that it does not replace cleanliness in animal, milker or stall, as it will not remove bacterial dirt and that part of visible dirt that may be taken into solution by the milk.

When the milk has been taken into the milk room the chances of dirt entering it are still present. Dust, loaded with acid forming bacteria, is here to be encountered, and the additional danger from flies here enters. The fly is bred in filth, and finds all kinds of filth and clean foods equally to its liking. He may come from feeding on the manure pile directly to feed upon the milk in the milk room, and, while without his presence the chance of contamination of the milk by intestinal and disease bacteria should be but slight, in the absence of a sick worker, yet his presence causes all of the factors present in the stall to appear in the milk room. The returned milk bottles and cans also offer chances for contamination by the bacteria that may have been returned in them. Many epidemics of disease have been traced to the use of returned bottles thus contaminated.

Scrupulous cleanliness, as scrupulous as in any room of our homes, is needed in the milk room, both in the room itself and in all of the dishes, cans and bottles used there. The room should be kept as clean and sweet as any other room in the house. It should be screened so that flies cannot fiind entrance. The cans and bottles should be sterilized, if possible, before being used; but should, at any rate, be scalded out before such use. The workers should keep their persons and clothes as clean as in the dining room. If this is done there will be no chance for visible dirt to enter the milk during its preparation for the market, and but little chance for the entrance of bac-

terial dirt. Cleanliness is the watchword for obtaining clean milk in the stable, and scrupulous cleanliness must be the watchword in the milk room. Couple this with cooling the milk below 50 F., and a clean milk from the milk room will keep sweet until it reaches the consumer, and will not contain a bacterial content much over that which it had when it left the producer.

To produce such a milk as this is to produce a milk that will not cause disease among the users. It is not producing "certified milk" by any means, but it is producing milk such as those who use it for a food have a right to expect. It will cost more than it does to produce a milk in the old way, where no precautions are used; but, when the value of such precautions to the consumer once becomes known, as well as the high food value of milk, complaint on this score will in no way equal the present complaint on account of dirty milk.

These precautions seem so simple and common sense that one is likely to take it for granted that they are always employed by a producer of milk. We would naturally expect him to be clean in the production of his food commodity. But long accustomedness to the old methods of milk production and marketing have led to a different conception of cleanliness in milk than in other articles which we eat and wear. In addition, the dirt in milk is easily hidden, and is seldom seen unless we look at the bottom of the milk bottle. How many of us do this? If many of us did we would have a new idea of this common article of food.

This condition of dirty milk is all too common, as is shown both by the number of samples of milk which show visible dirt, and by the great economic loss to the community through sickness and death. Examination of our records for the past year shows that 37% of the samples of milk that we have received have shown such an amount of dirt that it was readily detected by the naked eye. Such a proportion of dirty samples shows the methods in use by the producers of our State to be far from cleanly, and when we remember that this physical dirt in our milk is but an index of the bacterial contamination, which is more far-reaching in its effects on health, the conclusion seems warranted that our milk supply is in very poor condition. Physical examination of the milk of the State thus shows that it possesses possibilities of causing trouble through bacterial contamination. The question arises as to whether or not milk does cause disease, apart from epidemic disease.

In spite of its high food value milk does not form any large part of the diet of the average adult person. Milk forms the main article of food of two classes of persons, i. e., the sick and our children. In both of these cases the milk is usually taken in its raw and uncooked condition. Milk furnishes a fine ground for all kinds of bacteria to grow in. Bacteria introduced into milk do not die out as they do in water. They continue to multiply the longer they remain in the milk. In other words, a contaminated milk increases its contamination hour by hour; it gives no visible evidence of this increased contamination, and it forms the main article of food of that class of our population which is least able to stand anything but the purest of food. The easiest contaminated, and the most commonly contaminated of our foods, from a bacterial standpoint, forms the principal article of diet of that class of our population whose powers of resisting disease are the least.

The following figures, from the 1910 Report of the Massachusetts Department of Agriculture, are instructive. It is estimated that there are one and a half million children in this country under one year of age, and that one million of them are, for one reason or another, dependent either wholly or in part upon cow's milk for their food. German statistics show the following death rates per thousand of children fed on various foods:—

Fed on mother's milk	7.4
Fed on mother's and cow's milk	21.4
Fed on cow's milk	42.1

This makes cow's milk nearly six times as deadly to our infant population as is mother's milk. In our cities, where sanitary conditions are especially bad, the death rate for infants fed on cow's milk often exceeds ten times the death rate of those fed on mother's milk. An especially instructive point is the fall in the death rate of children fed on cow's milk when a supply of pasteurized milk is provided. Pasteurization improves the quaility of a milk only on the bacterial side. It does not aid in its digestibility, but rather the reverse. Yet pasteurization lowers the death rate of the children using such milk. This is as good proof as we need that it is the bacterial contamination of the milk that causes the trouble.

In view of the above facts the demand of our people for clean milk, which means a bacterially good milk, is reasonable. No town would stand for a public water supply which was known to cause as many deaths as unclean milk does among our children. But we have come to look upon this high infant mortality as almost a necessity; and have only lately appreciated its needlessness. The need for clean milk must be instilled into the intelligence of our people before the demand for such milk will arise; but the efforts of boards of health, agricultural societies and charitable institutions have produced the awakening to a considerable extent. Now we have a demand on the part of the people for clean milk, because they are beginning to know what it means. It is coming to be a more and more common practice for the purchaser to look at the bottom of the bottle of milk for dirt, rather than at the top for the cream layer. The growing intelligence and demand of these people must be met by the production of a clean article of food; and in meeting this demand the producer is entitled to an increased price for his product.

Such a degree of cleanliness as will give a milk that is free from visible dirt, and so from excessive bacterial dirt, is not hard to attain. If the milk industry were just starting no person would think of producing anything but clean milk. It is the old and slovenly idea of milk production that we must banish, and which we must pay to banish. If we are willing to pay for clean milk we will get it, and the sooner we accept the fact that clean milk is an economic problem, the sooner we shall get an article of food that meets the requirements of our present day ideas of a food, namely a clean article, produced from healthy sources, and handled and marketed in a clean manner.

ADDRESS ON DAIRY PRODUCTS.

By S. C. THOMPSON, Dairy Division, U. S. Dept. of Agriculture, Washington, D. C.

It is several years since I have had the privilege of addressing a convention of dairymen in the State of Maine, or in fact, since I have had the opportunity of attending a dairy meeting, but because of my association with the work in this State and my belief in the possibilities of Maine, I have watched with interest the development of dairying, and of agriculture in general. I believe that we have opportunities that even our own people do not fully appreciate. I believe that the State of Maine would do well to advertise her possibilities and get from outside, men who are willing to work on the farms, who are willing to care for the cows, and who will give us a new inspiration, so to speak. The people of Maine are inclined to be conservative. They are conservative perhaps because in generations gone by many progressive men went west, and, as some one has said at this meeting, those people have continued to move from place to place. They have been successful but they are looking for better opportunities. I believe that in the cheap lands of Maine, and our close proximity to markets, we have something to offer those people. I note from a preliminary census report, which is not entirely official, that this State has lost in the last ten years practically 18,000 cows. Now that to me is not so serious as it may sound. If the people in the State of Maine have been careful in their selection, have done their weeding properly, I have no doubt they are getting more money from the cows now in the State than they were from the larger number. I know that something has been accomplished along this line of weeding out, and I hope that some, at least, of the cows that have gone out of the State, that have helped to decrease the number, are among the poor ones.

It is not my purpose, however, to discuss Maine conditions today, but to talk with you for a few moments regarding the dairy products of our country as a whole. The State of Maine has so many advantages over other states in the Union that I am always very glad to mention them. I am satisfied that the quality of dairy products sent from the farms in Maine to the creameries is superior to that delivered to the creameries in any other state, which is perhaps the greatest advantage of all. A little later I will touch that proposition and explain why it is so. The country as a whole has increased in the number of cows in the last ten years three and one-half million. We hear it said very often that dairying is not improving, that it is not increasing, but the fact that we have made an increase of 21 per cent in the number of cows in ten years indicates that in some parts of the country they are becoming more and more interested in dairying. The census of 1900 showed, I believe, that about 42 per cent of the value of the dairy product sold was consumed in the form of milk and cream. We haven't any figures in this line for 1910 available at the present time, but there is no doubt that the amount of milk and cream consumed has increased, and I think it is safe to say that the quality of the milk sold for direct consumption in the various states in this country has improved. There has been a general agitation along this line and although producers very often feel that they have been placed at a disadvantage, that they have been required to do certain things in order to have their milk pass inspection for which they are not getting pay, there is no doubt that improvement has been secured to the benefit of both producer and consumer. I agree with Commissioner Buckley who has said that the people must demand this better quality of milk and be willing to pay for it. I personally believe that we should have clean, wholesome milk, free from disease germs, and produced under sanitary conditions, and that consumers should not question a reasonable charge for the same, but we know that a great deal of milk produced heretofore has not been produced under those conditions. We really did not know better, but we are finding it out and improving. I am glad to see that there is a general uprising in this line and I believe we shall get a public sentiment aroused that will require more sanitary conditions and that the public will be willing to pay a reasonable price for the product when they can be assured of its quality and healthful-

ness. Prof. Evans has discussed the milk proposition from a bacterial point of view, and as my work at present does not bring me in close touch with the milk problem I will not speak of this. I am engaged in work relating to manufactured dairy products and come in contact with about all of the manufactured products, and it is along that line that I wish to speak for a few moments. The butter produced in this country, I am sorry to say, has been deteriorating in quality. It is not true, perhaps, in the State of Maine, but it is true generally and I believe that the people of the Middle West are responsible in a degree, for the condition that exists today. They fought against the introduction of the hand separator; they could see no good in it and they were bound it should not come into general use. At the same time the number of hand separators was increasing day after day and month after month. The facts are that the people who put in hand separators were doing so against the recommendations of their creamerymen and without any assistance on their part; consequently they felt that they would handle that proposition as they saw fit. Now I believe that if the creamery operators as a whole had handled this matter as the creamery operators in the State of Maine did, had insisted upon quality, had shown the farmers how to care for their cream as they had been caring for their milk, and had paid for quality, we would today be making a much superior butter product everywhere. It has been estimated by competent authority, I believe, that not over ten per cent of the butter that reaches our big markets would be classed as extra, according to New York grading, which means that ninety per cent of the butter product that reaches our large markets is not of a good table quality, or at least, it is not considered by competent judges to be of a good table quality although much of it has to be used on the table. That condition has come about largely through the centralization of cream. We in the State of Maine know nothing about this condition and I am glad that we do not, and I hope we never will. But in the sparsely settled sections of the West, where hand separators were introduced, the creameries began reaching out for cream. They did not teach the dairymen to care for the product, they did not insist on frequent deliveries, and the results were, and still exist today, that much of the cream was shipped for long distances, perhaps three and five hundred miles in some instances, without having

proper care. In one case I have in mind, cream a week old that had had no care on the farm, had perhaps been set under the shade of a tree as the only protection, was transported by team sixty miles and then shipped by rail to the creamery once a week. In some instances if a man had but little cream he did not deliver it oftener than once in two weeks. This condition exists today in some sections of the country and while the hand separators have made such results possible, I believe their use should not be condemned as they may be made a most satisfactory way of handling our cream product for the creamery. We are working hard for an improvement in the quality of our cream product in many states. That is why I say that Maine is producing and delivering to its creameries a better product than any other state. Even the State of Vermont, considered a few years ago the banner dairy state of the country, does not hold the enviable position it once did. Its butter was considered the standard of excellence but it has fallen off in quality. Probably the State in the United States that is making the greatest showing as regards quality is Minnesota, and yet they have those large centralized plants with their poor product. While the State of Minnesota holds an enviable record, it is on account of the whole milk creameries which now exist, and the operators of those creameries realize the importance of instructing their patrons in the care of their product, whether it be milk or cream. It is a fact that I am very glad to note that the highest score received at the Iowa Dairymen's Convention held at Waterloo this last fall, which I had the privilege of attending, went to a gathered cream creamery, and I believe it is the beginning of a new era and shows that the quality of hand separator cream can be fine. This is not particularly interesting to Maine people as to any application they can make to their own condition, but it may be interesting to compare results here with those in other parts of the United States. Quality is the first consideration, in the production and manufacture of all dairy products, and when we are able to produce butter of the highest quality we can always command the highest price. I shall be glad to see all butter sold on its merits, and when that time comes the producer of butter of poor quality will be driven because of necessity to supply a better article. Some states are passing laws controlling quality, but this should not be

necessary, and I believe the quality question will eventually work out to the advantage of every one.

Ten years ago, according to the census report, about one-third of the butter product of this country was manufactured in creameries,—amounting to 420,000,000 pounds. The last census shows that the amount of butter manufactured in creameries is 624,000,000 pounds. I suppose this increase comes largely from producers who formerly were manufacturing dairy butter that are now patronizing the creameries. We have not definite figures, but in my judgment the amount of butter manufactured today is not much greater than ten years ago. I am basing this assertion on the facts,—that the increased population requires very much more milk for direct use, that the ice cream industry uses greater quantities of cream, and that the condensed and dried milk industry has practically doubled. I have no doubt that the increase in the demand for whole milk, the increase in the demand for cream for ice cream purposes, and the increase in the amount of condensed and dried milk, will make up for the increase in the number of cows in the country. The cheese industry in the last ten years has fallen off very slightly. I think the figures show a decrease of about two per cent. In fact, the cheese of this country is now made very largely in the states of New York and Wisconsin. Cheese production in the State of Maine has gradually diminished; caused I presume by the high prices that our creameries are able to pay for the sweet cream product. Maine is certainly fortunate in this product. When I say that I think the opportunities for dairying in Maine are most excellent, I base that assertion on the fact that we are close to the very best markets in this country, and that the sweet cream markets as a whole will pay more for the product in such a form than in butter. If we were to sell whole milk we would undoubtedly get a little more money for it when close to the market, but we would lose the valuable skim-milk which all dairymen prize. The problem that confronts us today is how we are going to increase the number of our cows, and increase it with the kind of cattle we want to keep. And I know of no way that we can accomplish this except by breeding them ourselves, and breeding from stock that we know is of good quality. When we do that then the skim-milk is one of our greatest assets, and everything considered, the market for sweet cream is hard to beat.

I have some figures on the manufacture of dairy products which I will quote, as you may be interested in them. The total number of dairy manufactories,—including creameries, condensed milk factories, cheese factories, etc., in 1904 was 8,926 and in 1909, 8,479; a decrease you will see of 447 or 5 per cent. From 1904 to 1909 the amount of capital invested in dairy manufacturing establishments in this country had increased from $47,000,000 to $71,000,000, over 50 per cent. This shows a smaller number with greater value. The production of condensed milk in 1904 was 308,000,000 pounds and in 1909, 495,000,000 pounds, or an increase of 60 per cent. There are no figures given on dried or dessicated milk but there are ten factories in operation in this country, an increase of four or five during the last year and a half, which indicates that that industry is being developed. The ice cream industry, to which I referred a few moments ago, has certainly increased very rapidly and is now one of the important branches of manufactured dairy products. It is estimated by various authorities that upwards of $100,000,000 worth of ice cream is manufactured every year. Some estimate it as high as $150,000,000. It is also estimated that $30,000,000 are invested in the business. Unfortunately the last census report will give us no data regarding ice cream, as I understand the enumerators were instructed to get no information along this line. Ice cream has opened up a field for marketing sweet cream at good prices, and is one of the products that has brought about improvement in the quality of our product. We have at the present time, however, an unfortunate situation regarding the cream for ice cream purposes. The Homogenizer is being generally introduced throughout this country. It was first used, I believe, to give the cream for ice cream making a smoother body, and to make a thin cream appear heavy. We have now about reached a point where instead of using it for this purpose, ice cream manufacturers are buying butter, melting it, letting the salt and the curd settle, and using the butter oil to mix with skim-milk and by homogenizing it, making cream. That in a way is going to deprive the producers of cream of this market. There would not be so much objection to this sort of thing if the people would use a good grade of butter, but unfortunately they are not always satisfied to stop with a good grade of butter. They sometimes take a poor grade and even in some instances, I am told, use packing

stock intended for the manufacture of renovated butter to make cream. This is a proposition that the State of Maine sooner or later will have to meet. I have no doubt that we shall get some legislation regarding it. I think it is an unfair competition and may be considered in somewhat the same light as the imitation products of butter.

We have been told repeatedly that it is not a good plan to discuss the defects in dairying; that it is better for people not to know some of the little tricks that are being perpetrated. But I believe that every person who consumes dairy products should know just what he is eating, and that he has a right to demand a quality of product that is satisfactory to him. If he wants to use an imitation product for butter, or if he wants to use ice cream made from oil of poor quality mixed with skim-milk, I have no objection to his doing it, but I do not believe he ought to be required to eat that product and believe he is eating butter or ice cream made from cream, for which he is paying the price of the genuine article. If the consumers are ignorant of the facts, how are we ever going to get even a public sentiment that will favor the proper handling of those products. I do not feel that we are doing anything criminal when we let everybody understand the true conditions. It has been said that we can depend upon the people and I believe we can if we will only be frank with them, and let them know what there is for them to know. Then it seems to me they will deal with the problem in the very best way possible.

In conclusion, let me say, Gentlemen, that the State of Maine may not be doing a great quantity of dairy work compared with some of the other states of the Union, but the people are showing an unusual interest in certain sections and I believe that interest will spread. I hope it will, and I hope we will have dairying more firmly established in Maine than we have today. It may not be possible for Maine dairymen to go into the business as extensively as some others, but I do believe that the dairy in connection with diversified farming offers opportunities that you will not find in any of the specialized branches which have been mentioned by Mr. Guptill. The question of what we are going to raise is one that every individual farmer must work out for himself, but if we will conduct our farms so that we can market our products as far as possible to the dairy cow, and we have the right kind of cows, I see no reason why the

failure of the potato crop this year, or the cabbage crop next year, will affect us materially. The product of our dairies will command a price that will not vary much from year to year. If we will make dairying the foremost branch of our agriculture, and plant such crops as will assist us to feed our animals, with the proper kind of animals, of which we have some and can breed more, then I believe we will have the problem solved. We will have a certain amount of money coming to us every month and can depend upon it without the fear of a failure of the crop or of low prices. I feel confident that the farmers in Maine can successfully employ dairying as a safety valve to their agriculture, on which they can depend for a good living.

THE VALUE OF MILK INSPECTION IN THIS STATE.

By RUSSELL S. SMITH, State Dairy Inspector.

The value of almost anything would necessarily be the demand for that thing, and I think that the value of the milk inspection in this State depends upon the actual need for that inspection. There can be no question in any of our minds but that there is a great value attached to such work as this, because it not only protects the public, but helps the honest milkman. Unscrupulous milkmen will impose upon any community to almost any extent if there is not some law or some means by which to curtail them. So, in the first place, the public is protected, and in saying the public of course all classes of people are taken into consideration but first and foremost would be the younger generation,—the infants and the young children.

In protecting the public, the system of inspection endeavors to punish all offenders, and like all progressive movements it has its friends and enemies. Many of its so-called enemies are made so, not through any personal grievance but through a lack of understanding what its object is, along with mis-statements of others not posted. Its friends are not always placing the dairy farmer in a subordinate dirty class with no respect for the rights of others and willing to dispense dirty milk and disease. Such persons do the cause much harm by arousing the contempt and antagonism of the dairy farmers. Inspection's true friends are those who have the dairy industry at heart, who recognize the defects of an inspection system but who see what can be accomplished if inspection has the backing of our better dairymen and leading dairy papers.

As I have stated, the need of inspection must be apparent to all if cleaner milk is to be had. In my annual report I have shown that out of nearly 800 samples of milk collected, over one-half or 51.6 per cent were reported either dirty, or slightly dirty. These figures are convincing when the dirt is contained

A Maine Herd of Pure Bred Ayrshires.

in only one-half pint of the original milk which had been well mixed. If the original milk contained as much sediment in proportion, I feel certain that none of you would want very much of it to feed your children.

It is easy to see that both the public and the farmer are losers because of this inferior quality of milk, but what a few dairy farmers are to blame for should not be charged against the dairymen as a whole. For this reason, if for no other, the clean, careful dairyman should demand that he be protected from loss brought about through the carelessness of others. There seems to be little inducement for him to care for his milk and cream when his neighbor does not and yet gets the same price. There is likewise little incentive for the progressive creameryman to reject the careless dairyman's product when he is sure his competing creameryman will receive that product. Someone must help these men in seeing that the milk and cream are produced and cared for properly and whenever aid is needed the State Inspector stands ready to aid.

Of course if the system is not perfect an unscrupulous man may be overlooked, and may be selling watered or unclean milk without being found out, but sooner or later such things will come to the surface and such men are dealt with according to their violations of the law. The aim of the inspection is to find the seat of the trouble, placing the blame where it belongs. This may be with the consumers, from the fact that they are handling the milk wrong after they receive it, an instance where the blame should not be put on the producer of the milk. In some cases the trouble does lie with the man who is producing the milk. If so, and bad milk is found, it is traced back to its source. Often the farmer thinks that the milk inspector is his enemy, and often on the first visit the inspector is a very unwelcome visitor; but after talking the situation over with the farmer and trying to make him see the advantages that would come to him by improving the quality of his milk, and the disadvantages that would come to him if his milk were not brought up to the standard, and up to a plane where his reputation could stand behind it, the prejudices of the farmer are usually overcome to a large extent.

It is easy to go to the average dairy farm and pick out defects, but unless a remedy is suggested, such criticism is best withheld. A dairyman has a right to ask why and how an improve-

ment is to be made and to this end good results have been accomplished by giving him as much information as possible.

This educational side of inspection for the farmer, this awakening to the need of better cows, better feeding and better management of the dairy has been too often overlooked. The hardest dairyman to get to improve is usually the one whose profits are least. Attention to the details is a requisite in any business and decidedly so in the dairy business. It is attention to the details that counts, for in this way profits are increased, making the necessary sanitary improvements possible.

To visit the farmer and criticize the methods on his farm, is not always a pleasant position for the Inspector to be placed in, but if the farmer is the right sort of a man, if he stands for progress and is ready to be helped in any way, when his mistakes are pointed out to him, he will say that he will try to do better. In many cases when a slight mistake is called to his attention and remedied, it will be of great assistance to him. It is a great satisfaction to the Inspector, after he has called the attention of a farmer to some minor details that have been neglected, to find on his next visit that the farmer will say,— "Those little points you called to my attention have helped me greatly; I had thought those things were too small to be of any importance."

The analysis of milk samples is reported in the Quarterly Bulletins of the Department of Agriculture, and the farmer soon sees that it is for his own interest that the milk that is reported against his name should be of the highest quality; should be clean and up to standard. He cannot afford to have any reports of milk that is below standard or dirty, because the moment the public, through the newspapers, or by inquiry, see that report, that milkman is bound to lose customers. The public need education along this line in the worst sort of way. The public are for the most part ignorant of what constitutes good milk. They think of milk not enough as a food but too much as a beverage. Some will say, "We have had milk for dozens of years and no thought has ever been given to the bacteria count, or to whether it is dirty or clean. It does not seem to change, it tastes about the same." They only know it by the name milk. The public should know just how many bacteria are dangerous to health and whether the bacteria are the disease producing kind or not. As Dr. Evans has told you,

the source of danger lies most emphatically at the beginning of the milk,—that is, in the stable and with the cow. Usually throughout the State, the farmers that are visited have the old methods in vogue. For instance, if the Inspector goes to a farm where unclean milk has been produced, he will ask the farmer if he is using a covered milk pail. Time and again men are encountered who say that they do not take any stock in these new methods, these new ideas. They have used an open pail for so long a time and they do not see why they should change. Then they will be asked if there is not always a certain amount of dirt on the froth as it rises to the top of the pail and they admit that they always see that. And when asked if they do not think that goes into the milk and some of it stays there, they will nearly always answer that they are using from 8 to 10 or 12 thicknesses of cheese cloth in straining the milk. But it is a well known fact that once the dirt is in the milk it is almost impossible to get it out, because some of the dirt is soluble in the milk. It is true that you can strain out some of the larger particles, but in straining, if the cloth is not changed, you wash some of the particles down through the cheese cloth. If some things like that are explained to the farmer who means to do well, he will at once become interested and before long you will find him writing to some concern, or writing to the Department, and asking for suggestions, or where he can buy a covered milk pail.

The demand for clean milk is growing in nearly every one of our cities. In the City of Portland I am glad to say that the right method has been taken in handling the milk. A city ordinance requires that the milk should be sold in bottles only, and should not be poured on the streets. If this should be enacted as a state law, it would be a great advance step in securing clean milk for consumption. Laws are being made in other states that require certain things from the producer, so that the product would tend toward cleanliness. In visiting the different farms oftentimes the cows are found to be very dirty. Now there is no law by which the owner of these cows can be prosecuted. The attention of the Board of Health of the town is always called to the condition of that man's tie-up, and the man is told that if he does not clean up the public will know of it and he certainly will suffer thereby. After all it is the fact of giving the public information regarding such a place that hurts a man

more than the Inspector's visit to him and the mere criticising from one man.

To show the amount of milk used in the country and the amount used per person I have gathered a few figures. "In the entire country the number of gallons of milk produced in a year is approximately 7,266,000,000 gallons and only 30 per cent of this amount, or 2,000,000,000 gallons, is used as milk. The rest goes into some of the other products, such as cream, butter, cheese and skim-milk. This leaves about six-tenths of a pound of milk per day per person, on the average." That is not as high as some would think. It is a small amount, and if figures could be gotten at now it would undoubtedly be higher, because the use of milk as a food is on the increase, as the public comes to realize that milk is valuable and that clean milk is a wholesome food as well as a very economical one. "The milk and cream of the country constitute about 16 per cent of the total food of the average family." There are many babies in this State and a large number of them depend entirely for food upon the milk drawn from the cow. It is found by statistics that the per cent of bottle fed babies is on the increase. Infants and young children furnish the principal market for most of the milk. The fact that the number of bottle fed infants is on the increase shows that some attention is being paid to clean milk. There are no American statistics available on the death rate of bottle fed children as compared with breast fed, but German statistics show that for every child that dies, fed on breast milk, six children die, fed on cows' milk. So you see there must be something the trouble with the milk, or the milk is not adapted to infants. It is found that by modifying it, it can be perfectly adapted to them, and therefore the trouble must be that there is some fault with the milk. Too much attention is given to the fat content of the milk. Milkmen all over the State have a very wrong impression. If any trouble is found with their milk they will say, I do not see why there should be any trouble with my milk, it has always tested well. The consumer has that very same idea. He will say, "This man's milk tested well." The trouble lies in the fact that the test of the milk applies only to the butter fat content, as the people in general know it. If the test should include the dirt in the milk and the amount of dirt was reported with the butter fat, the public would have an entirely different idea of the subject.

The fact that milk tests good in butter fat does not show that it tests good in absence of dirt. So, too much attention is given to the wide, deep cream line on a bottle of milk. In my estimation the absence of dirt in the milk is of far greater value than fat above the required standard. The causes of the bad milk that is distributed in different sections of the State should be understood by everybody. I have grouped them under four headings,—the cow, the air, the method and the man. The first, of course, is the cow, and she is the source of an untold number of bacteria, from the floor, from the manure, from the ceiling, from the food that is given her. In fact, if the cow is not clean you cannot reasonably expect to get clean milk from that cow. Recently I was called to a small town on request of the local inspector there who had received complaints from several families with regard to children's sickness. The family doctor had reported that the sickness was due to bad milk. Now that may be true, because previously the man had said that the cow herself was sick, and who would not reasonably expect that milk from such a cow would cause the children to be sick. A man who will feed to his children milk from a sick cow should have no cause to complain because of the sickness of the children. At the same time it should be emphasized that provided the milk is not the cause of the sickness the doctors should be very careful about laying it to the milk. Milk is a very sensitive carrier of disease germs and almost anything may be attributed to it. But in all those cases the history and the source of any trouble is always looked into.

The second cause for bad milk is the air, to which the milk becomes exposed. The stable air is given but little thought, and much has been taken for granted by the average farmer along this line. Anything other than a strong ammonia odor and a very strong cow-like smell is unknown on many of our farms, especially in winter when the tie-up is filled and the animals have not been out for exercise since the snow came. A cow stable in which the air is almost stifling to a person can hardly be very healthful for the animals who have to stay there continually. When the milk is exposed in an open pail or poured into a large can and left exposed to the stable air, is it any wonder that it tastes like the cow? Proper stable ventilation is given too little attention by the average dairyman. When improper systems are used it is not uncommon to find the air

close and stuffy in the morning after everything has been closed up tight at night. Such air is heavily laden with bacteria that enter milk and cause trouble. I wish it might be my fortune to show every lax dairyman the number of bacteria that fall on a specially prepared medium, per cubic centimeter. The colonies that develop where a single organism falls and the character of these after a few days' growth, would, I feel sure, convince any fair minded person that milk, above everything else, should never be exposed to that air.

The third cause for bad milk, as I have noted, is the method Usually method goes along with equipment when a scoring is being made and it has been found that the man with the best equipment often falls low in his total score due to improper methods. A man may invest in an expensive equipment and still be a producer of anything but clean milk.

The method includes the cleanliness of his animals, whether he wipes the udder or not, the general cleanliness of his stable, number of sweepings, time of sweeping, cracks in floor and ceiling, disposal of manure (a very important detail), system of ventilation and exercising of animals. These all influence the germ content of the air and the consequent germ content of the milk.

The method of milking, and the care and handling of the milk are perhaps most vital of all requirements. Too often the milker milks with moistened hands, a practice that is very unclean at its best. The pouring of the milk in the stable, the filling of a large can that is left exposed until filled, the lack of straining, or the lack of use of a covered pail, all come under improper methods. Whether or not the milk is immediately removed and cooled and kept cool is often the deciding point as to its germ content, which is all important.

Last, but not least, we could not expect a dairy to produce good milk unless there was a competent man at the head of it. The farmer who loves his animals, sees to their constant comfort, studies their requirements and feeds them all they need, without overfeeding, is the one who succeeds. Unless a man knows and likes his animals and they know him, he has no business trying to produce milk. The hiring of cheap help and endeavoring to produce clean milk by rules and disinclined men have not been a very successful venture. An ignorant, careless, filthy and vicious milker has no place in a cow stable where the

best is sought after. There is hardly any other trade or profession that demands so many requisites in one man as dairying. So when we know that for success in dairying we are entirely dependent on the milker's skill and good will, it is not difficult to see that the proper man is indispensable.

To show that milk inspection should be carried on and is of great value, let us look at the following facts. "In the country as a whole, up to last year there were 500 epidemics of disease in 35 years. 317 of these epidemics were of typhoid, and typhoid is essentially a country disease, resulting from poor sanitation and flies and general filthiness around a farm. 125 of these epidemics were from scarlet fever and 58 from diphtheria, and each one of these was traceable directly to the milk." That shows that milk is a very sensitive carrier of disease and epidemics anywhere may be traced to the milk. This may come about not directly from the milk itself, but because of the germs in the milk; that is, the milk does not produce the disease but the germs in the milk do. A short and perfect rule that can be applied to every producer of milk is that the milk should be kept clean and cold. If that motto is followed out to the letter a man will have no trouble whatever in finding a market for his milk. The fact that cream at the National Dairy Exposition at Chicago in 1906, which was put into cold storage at 33 degrees F. after it was exhibited, kept sweet and palatable for seven weeks, shows that if milk or cream is clean and cold it will keep wholesome for a long time. I have made a chart which I have here, to show that the cost of the actual digestible dry matter in milk is not anywhere near as much as the cost of the actual digestible dry matter in other articles of food. Of course the actual amount of dry matter in a food is what we should pay for when we buy a food. Too often we pay too much for the name of the article, and not enough for the actual food value in it.

COST OF DIGESTIBLE NUTRIENTS PER POUND IN VARIOUS FOOD STUFFS.

Kind of Food.	Nutritive Ratio.	Ordinary Price.	Cost per Pound Digestible Dry Matter
Porter house steak	1 : 2.1	30 cents pound	$0.80
Round steak	1 : 1.5	20 cents pound	.64
Hamburg steak	1 : 1.5	20 cents pound	.60
Eggs (1 dozen equals 1½ pounds)	1 : 1.7	36 cents dozen	1.03
Skim-milk	1 : 1.8	2½ cents quart	.14
Plain milk	1 : 4.3	7 cents quart	.28
Ham	1 : 4.2	25 cents pound	.65
Certified milk	1 : 4.3	15 cents quart	.60
Clean milk	1 : 4.3	12 cents quart	.48
Cream	1 :18.0	40 cents quart	.80
Bacon	1 :15.0	25 cents pound	.35

We will see that if we pay even 10 or 15 cents a quart for good clean milk, we will not be paying as much, considering the actual food value, as we do for some other foods. As a source of digestible dry matter it is very economical, a fact that few people understand.

In visiting the different dairy farmers throughout the State it is very often recommended that certain changes be made so that the milk will be a little cleaner. This often necessitates a slight cost on the part of the man in charge of the farm. It does not mean that he must at once invest a large capital, and put cement floors under his cows or have white tiling in his milk room, or anything like that. A small change will bring about results. If a man can be induced to use a covered milk pail he has been started on the right line, or if he can be induced to whitewash the entire stable or to put a few more windows in or to have his cows a little cleaner, to wipe the udder with a damp, or a dry, cloth and to give the cows a good scrubbing at least once a week. Of course if he is to produce clean milk he must change a little from the old method that has been

in vogue for so many years. It is rather hard to get a man to change when he has been doing the same thing for dozens of years. He does not realize just what the benefits will be, but provided he does change and installs the covered milk pail or perhaps builds him a milk room a short distance from the stable, and builds an ice house, he will find that such improvements will not cost him very much and he will see something coming in, in return. At present the milk business is hardly a business in which much more than a living can be made. In Commissioner Buckley's remarks this morning he claimed that he had been in the milk business for twenty years and there was no great profit in that business. I find that to be the case all over the State. Men say they can get a living at it, but it is not a business as it should be. The added cost on account of the little extra labor required in the production of clean milk will make the expense a little greater. A little more attention to details is required, perhaps half an hour more of time in the tie-up at milking time, to go over each one of the cows, and all of this must go to the added cost. But when the public at large understands thoroughly that all of this attention to details means more expense, and also that they are getting milk at a very cheap price as compared with its food value and its cost of production, and that the farmer has improved and they are getting a clean, wholesome product, I see no reason why they should not be willing to pay the farmer a little more for his work. Very often it is said, and the farmer himself believes it, that the inspection of his premises and of his milk is of no benefit to him; that the people are getting milk at a very cheap price compared to what it costs to produce it, and that he is not getting compensated for his work. That is all very true, but the public, in turn, demands something from that farmer before they will give him an increase in price. In order to get that increase he has got to prove to them that his methods and his product are better and more wholesome than they were before he changed them. If in some community some one dairyman should start ahead and act as a model for the community, and advertise that he was producing clean milk, and place his cattle and his methods open for inspection of the entire public, that man would get the price which he asked for his milk; gradually the other men would imitate him and in that way the standard for that community would be raised. And

when a man does that, he should be favored with the trade of the public at large instead of the unscrupulous man who is careless in his methods, and thinks that just because he has the trade he can let anything go to his customers that has the name of milk.

Too often the details of the farm are left to the hired help. The dairy business is not a business in which the farmer can leave everything to his help, and grow rich himself. If he does there is sure to be some mistake. The help is usually trying to get the work done quickly and get somewhere. They want to slip over things, and unless the farmer is there on the spot to supervise everything, the work is not usually done as it should be done.

In conclusion, the dairyman who is willing to keep records, to find out the cost of feed and study the individual cows so as to feed them properly, and who guards against careless milking by his helpers, who tries to master the details of his business, who uses a little brain work here and there instead of so much actual hard labor, and who is always trying to look forward to the future and to the advancement of his business, should be recognized. It is to this man that the increase in price of milk and the respect of the public in that community should come.

ANNUAL MEETING MAINE SEED IMPROVEMENT ASSOCIATION.

WATERVILLE, MAINE, NOVEMBER 21, 22, 23, 1911.

TUESDAY EVENING, CITY HALL, 7.30 O'CLOCK.

The opening meeting of the Maine Seed Improvement Association was called to order at 7.30 o'clock by Mr. E. C. Wardwell, President of the Waterville Board of Trade, who introduced Hon. Frank Redington, to speak the words of welcome on the part of the city. Mr. Redington spoke enthusiastically of Waterville's beauty, its progressiveness, and its advantages as a convention city, and extended a very gracious and cordial welcome to the Association as an organization, and to its members as individuals. "You represent the people who produce the food supply of the world; we who are exchangers are of small account compared with those who are producers. We need Associations that grow things. If man is to progress he must associate with other men and learn from them. He who knows a thing and keeps it to himself is of no more benefit to the world than he who knows nothing. Specialization seems to be the thing toward which everything tends. Farmers generally have generalized too much. It seems to me that farmers go into farming on too small a scale. This plan is not in accord with methods followed by business men. Co-operation has come to stay; we have it in almost all branches but we do not want monopoly. Monopolies are good for those who monopolize but may not be good for anyone else. Monopoly must be looked after sharply. It is your duty to attend your meetings, extend your support, and help the State to keep in the front rank of producers. Your Association is welcome, thrice welcome."

The response to the address of welcome was given by Hon. W. G. Hunton, President of the Association, who very appropriately referred to the fact that less than two years ago, on

January 25th, 1910, about fifty farmers from all parts of Maine gathered in the very room in which the present meeting was being held for the purpose of organizing the Maine Seed Improvement Association; and that the membership had since then increased to one hundred seventy-five.

The principal address of the evening was delivered by Dr. George M. Twitchell, of Auburn, who took for his subject:

"THE U. S. DEPARTMENT OF AGRICULTURE AND WHAT IT HAS DONE FOR FARMERS."

It is with no little regret that the Secretary is obliged to omit this very interesting and valuable address from the report of the Association meeting, the manuscript not being available for publication.

WEDNESDAY FORENOON, 9.30 A. M.

The Association convened promptly on the above hour with President Hunton in the chair, and the regular order of business was at once taken up.

ANNUAL ADDRESS OF THE PRESIDENT.

The past year has not been favorable to the greatest advancement and best interest of this Association. Extremely dry weather following seeding delayed germination and in many instances made it impossible. Early frosts prevented a thorough and natural maturing of some of our most important crops. But the grand exhibit that has been brought here by our members emphasizes the fact that they are ready to face nature in her most erratic moods and win fair success. This is our third meeting—our second annual exhibit, and at this meeting plans must be discussed that shall insure advancement for the coming year. In this age an individual or an organization cannot stand still, it must move—either forward, backward, or to the wall. That the field for advancement for this Association is so broad that we can scarcely comprehend it is patent to all. If we select any class of our products now on exhibition we fail to find a reasonably perfect specimen, and if we found one should we recognize it? Have we decided yet just what shall constitute a perfect type of even a few of our products? Before

Fig. 12. Potato Digging Scene in a Maine Field. Yield 135 Bbls. (370 bushels) to the Acre.

joining this Association I thought I could tell King Philip, Longfellow and Canada flint corn; Early Rose, White Mountain potatoes; and old fashioned yellow-eyed beans. But today I would decline to judge any of these products. At least I have discovered my own lack of intelligence. I think that this matter should receive the careful attention of this convention and at least be subjected to the investigation of a competent committee.

We have also come to a period where available seed should be really for sale by the members of the Association. While the first essential of the organization was to promote individual interest, this among the older members at least has been accomplished. The market is unlimited for the products of this Association and I believe some definite plan should be decided upon whereby this fact should be advertised; that the members who are in proper condition to take advantage of it should extend their operations in the spring and take material advantage of the business opportunity afforded them. It is possible now to raise some thoroughbred seed and sell it at a price accordingly. A Federation of all the agricultural organizations of the State has been formed, to unite and assist each other in any undertaking that may be deemed for the best interest of agriculture. This Association is entitled to two delegates. This is a matter for your consideration. Your Executive Committee that will be elected at this meeting will be asked to join with other organizations to hold a joint meeting next year, I believe. This is a matter of such importance that it should be discussed by the convention that the committee may have the benefit of some understanding as to how the Association feels about such a meeting.

REPORT OF SECRETARY, MAINE SEED IMPROVEMENT ASSOCIATION.

To the members of the Maine Seed Improvement Association:

In many respects the past year has been an exceptionally important one in the work of our Association. It has been one full of anxiety to the officers and a greater appreciation of the magnitude of the work undertaken has come to us all. The problems that have arisen have not, however, lessened the Secretary's faith either in the need for aggressive work along the lines undertaken or the ultimate success of our efforts. This phase of the proposition will be discussed in another section of this report and will therefore give place for the present to other items of interest as follows:

1—*Meetings of the Executive Committee.* During the year two meetings of the Executive Committee have been held—May 12th at Auburn, and September 5th at Lewiston. At the first meeting a tentative program was prepared and a part of the premiums definitely decided upon. The Secretary was instructed to provide some means for registering the names and addresses of all persons attending the annual meeting of the Association.

On motion of Dr. Twitchell, who in making the motion stated his belief that the Association should consider and work out plans for producing and exhibiting the various seeds and vegetables, the purpose being the establishment of a system of growing and exhibiting which will insure a uniformly superior grade of seed, it was voted that a special committee should be appointed by the President to take under consideration this phase of the Association work and to make a definite report at the annual meeting of the Association. In conformity with this instruction the President appointed the following committees:

On potatoes—Mr. Frank Lowell, of Farmingdale.

On corn—Dr. George M. Twitchell, of Auburn.

On beans—Mr. Frank H. Morse, of Waterford.

On cereals—Mr. Leon S. Merrill, of Orono.

It was also decided to make exhibition, if possible, in connection with other associations and organizations. This the officers have not found practical to do thus far.

At the meeting held at Lewiston September 5th final arrangements for the annual meeting were completed as indicated by the printed program and premium list.

2—*Division of the State into Corn Zones.* At the last annual meeting of the Association a special committee was appointed to consider the advisability of dividing the State into zones for the purpose of exhibiting corn. This committee will make a formal report during the present session. Your Executive Committee felt, however, in view of the sentiment prevailing one year ago in relation to this matter, that it would be advisable to follow the plan outlined by the special committee in making up the premium list for corn. The plan to be followed in succeeding years will, of course, be determined by the Association itself in its action upon the report of the special committee.

Mr. C. W. Barber, of the Department of Agriculture, was appointed Field Agent for the State by the Commissioner of Agriculture; and a place has been reserved in the program for his report.

3—*Exhibits By the Association.* Since the last annual meeting the Association has made two exhibits—one at Augusta during the session of the Maine State Grange and the other at the Fourth National Corn Show held at Columbus, Ohio. The exhibit at Augusta was of considerable merit and attracted a large share of attention. The one placed at Columbus, Ohio, was a big undertaking and would have been impossible except for the co-operation of the College of Agriculture and the assistance it received from the Maine Central and Bangor & Aroostook railroads. The result of that exhibit is now a matter of history to which we can point with a great deal of pride; for perhaps no single state brought home a larger share of awards than did Maine. The following awards of national importance were received by members of our association:

The national sweepstake in flint corn was won by Mr. Andrew J. Guptill of Berwick.

The first place in the world's series of early sweet corn was won by Mr. Dexter Burnell, of Cumberland Center. The second place by Mr. E. K. Holbrook, of Mechanic Falls.

The first place in the world's series in late sweet corn was won by Mr. Eugene H. Lowe, of Gray. The fourth place in wheat was won by Mr. George E. Files, of Benton.

All of these men are members of the Maine Seed Improvement Association. In addition, 12 other premiums were won by members of our Association in New England and state classes. Altogether Maine's exhibit at the Fourth National Corn Show was one of which we may well feel proud.

At the Maine Corn and Fruit Show held November 6-11 of the present year, while the Association as an organization had no separate exhibit, scattered all through that splendid show were found exhibits of merit made by members of our Association. The Association took an active part in promoting and supporting this first attempt at holding a state wide show for the exhibition of Maine's agricultural and seed products.

4—*Maine Federation of Agricultural Associations.* Acting in accord with instructions given at the last annual meeting of the Association the Secretary, acting for both the Maine Seed Improvement Association and the Maine Dairymen's Association, called a meeting of representatives of the different agricultural organization in the State to be held at Augusta, January 18th. This meeting was attended by more than 60 people representing nearly every agricultural organization that is state or county wide in its operation. At this meeting it was voted to organize an Association to be known as "Maine Federation of Agricultural Associations." The object of this Federation as stated is to so unite the various agricultural organizations of the State that all may work in harmony for the best interest of agricultural development. Its membership consists of such agricultural associations, societies, organizations, departments, and institutions—state and county wide in their operation—as may from time to time be elected to membership. The basis of representative membership in this Federation is,—each Association or Society shall be entitled to one representative and one additional representative for each 100 members, not to exceed three members for any one organization. The annual dues paid

by each member of the Federation shall be $2.00 for each representative it has in the Federation; and said dues shall be payable in advance on or before the annual meeting each year.

Your Secretary would suggest that a place be reserved at some business meeting of this Association for the reading of the report of the organization meeting and the by-laws of the Federation; also that the Association take definite action in relation to the Association and if thought favorable elect a representative, or representatives, to its annual meeting.

5—*Applications for Class A membership.* The Secretary has received applications from 40 of our members for Class A membership. The large number of members applying for this form of membership indicates the wide interest felt in seed improvement work and the ultimate success of our Association. This whole matter has been in the hands of the seed breeding committee and the Field Agent of the Association during the year.

6—*Future Work of the Association.* Our perception of the importance of the work we have undertaken is developing far beyond our anticipation. It is now evident that we have been none too particular in laying the foundation. It is also equally evident that we must broaden out in the scope of our work so as to include a very much larger number of farm crops than has been engaging our attention during the past two years. The difficulties attending any attempt at improvement of many of the common farm crops leads your Secretary to suggest that perhaps the very best thing that can be done by a large portion of our membership is to secure pure seed of good type and possessing ability to reproduce itself in large quantities and with this seed to grow a supply for general distribution, rather than to attempt any specific form of seed improvement themselves. Of course, this suggestion will not apply to the members of our Association who are so deeply interested in the problems confronting the farmers of our State that they are willing to spend time in careful and thoughtful study and experimentation for the purpose of improving the seed they now have. In this connection it is well to remember that the Maine Experiment Station is now engaged in some rather extensive seed breeding work, and from them we may expect in the near future to secure information that will be of the utmost importance in its relation to our immediate work. In view of

this the Secretary would recommend that arrangements be made with the Station so that members of our Association can secure for trial such seeds of quality as they may have available for distribution the coming year, believing this to be the quickest way by which pure seeds of good quality can be distributed among our membership, and ultimately among all the farmers of the State. The Secretary is well aware that a large number of our membership have been making a study of the work of the Association and its possibilities, and will undoubtedly have resolutions to offer for the direction of its work in the future. Also that a place in the program has been reserved for the discussion of the future work of the Association; therefore only a few recommendations will be offered.

RECOMMENDATIONS.

1—That, while the Association continues its special work with corn, potatoes, and small grains, it also undertake more definite work with beans, and such other crops as vegetables, vetch, and alfalfa.

2—That, in view of the fact that the Maine Experiment Station is now undertaking seed breeding work of considerable magnitude, arrangements be made so that members may secure from the Station for growing and distributing among the farmers of the State such varieties of seeds as it may have for sale from year to year.

3—That the Association recognize in a proper manner the service rendered to the State by the Maine Corn and Fruit Show, and those who promoted it.

4—That the Association keep in close touch with and give its support wherever and whenever possible to the efforts now being made to secure Federal aid in behalf of agriculture in each state.

5—That the Association give active support to the Maine Federation of Agricultural Associations.

6—That the Association place exhibits in so far as may be possible wherever such exhibits will advance the interests of the Association and of Maine agriculture. I will mention specifically at the present time the Maine Dairymen's Association meeting and the Maine State Grange.

7—That the Association consider carefully the premiums and methods of offering premiums at the future annual meetings.

This report ought not to be brought to a close without bringing to your attention the fact that acting under the direction of the Association at its last meeting the attention of the Legislature was brought to its specific needs, and the appropriation asked for—$500— was secured for the years 1911 and 1912. For the securing of this appropriation, so far as the officers of the Association are concerned, the credit belongs entirely to its President, W. G. Hunton. A copy of the resolve follows:

CHAPTER 114, RESOLVES OF 1911.

"Resolved, that the sum of five hundred dollars be and hereby is appropriated for the use of the Maine Seed Improvement Association for the year nineteen hundred and eleven, and a like sum for the year nineteen hundred and twelve, for the purpose of encouraging the breeding and development of pure seed; said appropriation to be expended in employing speakers, paying premiums and all other necessary expenses of holding an annual meeting of said association in Maine. This appropriation shall be paid to the Secretary of the Maine Seed Improvement Association upon the presentation of the proper vouchers."

Respectfully submitted,

LEON S. MERRILL,

Secretary.

The report of the Secretary was accepted and together with the address of the President referred to a Committee on Resolutions for further consideration.

REPORT OF THE TREASURER.

Bowdoinham, Maine, November 21, 1911.

C. M. White
in account with
Maine Seed Improvement Association Dr.

To cash on hand at last report	$ 63.25	
To cash received from Secretary		
for 1910 dues	1.00	
for 1911 dues	54.50	
for 1912 dues	6.00	$124.75

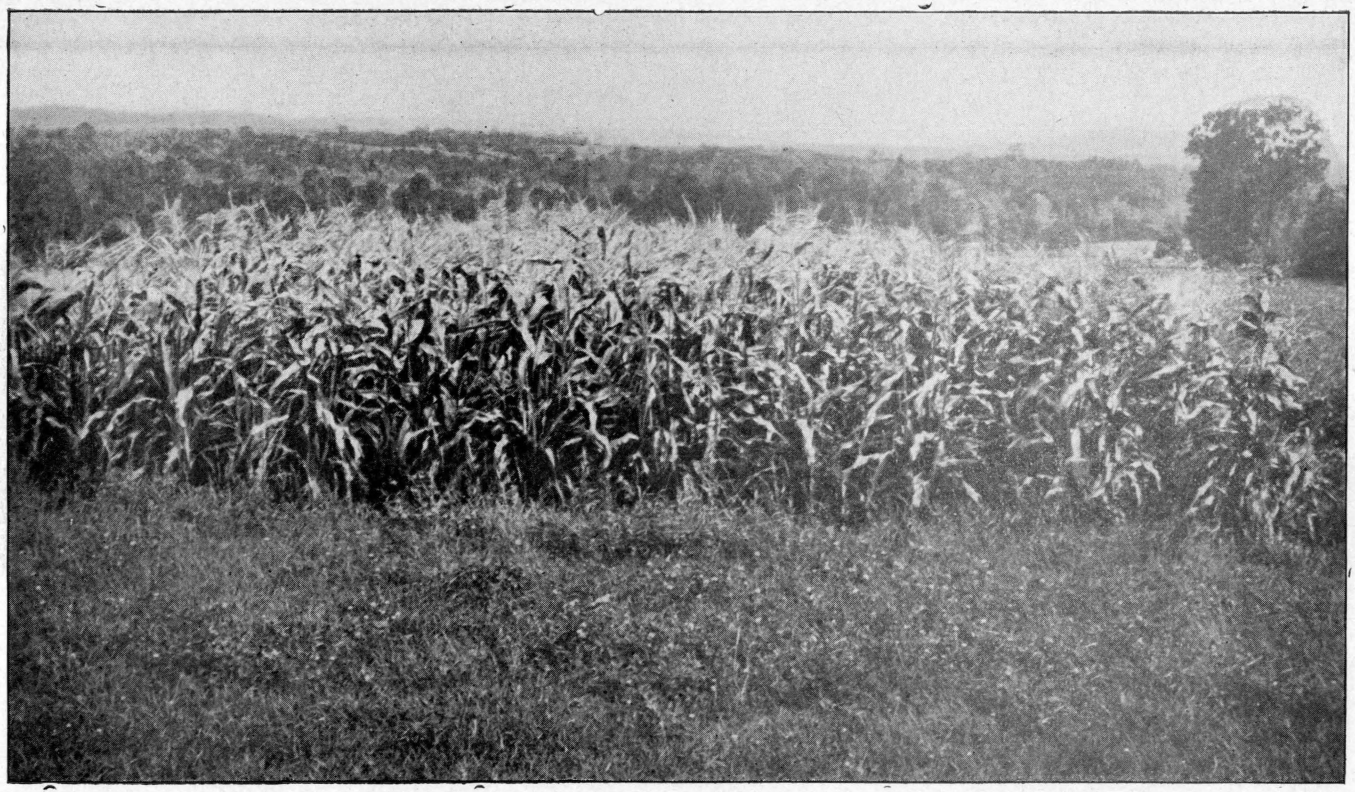
As no bills have been presented for payment during the year the above represents the amount of cash on hand in the Treasurer's hands.

C. M. WHITE, *Treasurer.*

The Treasurer's report was accepted.

At this point the President announced as a committee on Resolutions: Mr. R. T. Patten, Skowhegan; Mr. H. G. Beyer, Jr., Portland; Mr. C. M. White, Bowdoinham. Mr. Beyer stated that as he would be obliged to leave for home about noon it would be impossible for him to serve on the above committee, and Dr. Raymond Pearl, Orono, was appointed in his place.

Reports from the special committees were then called for by the President.



A Maine Corn Field.

REPORT OF SPECIAL COMMITTEE ON CORN.

The purpose of this Association is to encourage individual methods of growing, urging always that skill be exercised and the choicest product insured. Out of the consecutive work of many the essential principles at the foundation of successful corn growing will be established, something impossible if each one attempts to follow one line of work. The aim should be not only to increase the output, but above all else add to the food value of plant and kernel, something far more difficult to fix than growth of stalk, time of maturity, or gross yield. This Association should insist upon the ten ear row test, or the planting of at least 200 kernels from ten selected ears, those from each ear to cover one row, that more definite information may be obtained regarding germination, strength, and vigor of stalk, time of spindling, and tasselling, development and ripening of ear, as well as total yield per row. Only by this method can we approach systematic or uniform results. In this trial plat we have the foundation for improved seed selection. Every step taken must be carefully recorded if best results are to be obtained. Each row should be watched, time of breaking ground noted as well as date of planting, and number of stalks per row recorded as well as growth and vigor of stalks.

Later the set of ears must be noted as well as the total number at harvest time. Beyond this one must have a record of the number of well filled ears on each row. Starting with a single ear as the unit this record becomes of the greatest importance. It will be necessary also that all weak stalks be detasselled and only the more vigorous allowed to deposit pollen on the plat. Provision should be made for at least three inspections by a representative of the Association who should make record of details hinted at and carefully inspect all plats, large or small, from which seed is to be selected. As the conception of the ideal ear of flint corn is still undecided, no attempt should be

made by this Association to do more than stimulate systematic work in every feature of seed development. No standard of size, length of ear, or shape of kernel can be arbitrarily fixed today without retarding progress. Those who come amongst us from the great corn belt cannot force their ideal of type without inflicting lasting injury to corn growers here. Our nearness to the front line, with the variety of soil conditions, must necessitate freedom of individual effort though the end aimed at be one and the same. When certain fundamentals are reached it will be ample time to discuss uniformity of type. These have to do with germination, growth, size, and vigor of stalk, and ear development as well as cob shape, per one hundred kernels of seed.

In addition I believe it would be well for the Executive Committee to be governed by the following conditions in organizing the exhibition of 1912.

CONDITIONS.

First—All exhibits shall be made in the name of farm or owner of farm on which the exhibit is produced. Any attempt at evasion will disqualify all exhibits by the individual and if the fact is not established until after awards are made and premiums paid, the Secretary shall be authorized to publish the same in the press and withhold the endorsement of the Association from the party, it being the policy of this Association to protect those who are faithfully seeking to improve seed corn.

Second—All exhibits must be from the crop of the year in which the exhibit is made.

Third—In all ten ear or trace classes the final award shall not be made until, by chemical analysis, the sample ears have been tested to determine their actual food value, that being the basis of the award, all exhibits to be placed upon a 12 per cent crib dry, water content.

Fourth—Awards shall be based upon the size, uniformity, and shape of the kernels, and length and regularity of rows, as well as shape of cob, it not being the purpose to magnify the cylindrical ear at the expense of more important factors.

Fifth—In order to compete in any seed classes a sworn statement must be submitted with the entry, giving character of soil, crop grown in 1911, method of preparation in 1912, character

of seed, amount and kind of fertilizer used, and how applied, number of times cultivated and hoed, date of planting and also of ripening. This rule will be impartially enforced that the officers may be able to publish the essential facts with the awards and thereby render greatest service to the individual grower.

Respectfully submitted,
G. M. TWITCHELL.

The report of this committee was accepted and referred to the Executive Committee.

MR. C. M. GALLUP—I would like to ask for the information of those present the method employed in determining the water free content of corn.

The President requested Dr. Pearl to reply to this question.

DR. RAYMOND PEARL—The amount of moisture in corn is determined in the laboratory by drying the sample to constant weight with artificial heat. The loss of weight then represents the amount of water which was in the corn at the beginning. This can and usually is figured as percentage of total weight. Regarding the importance of this determination in corn shelling contests it may be said that no corn which does not carry *less* than 12 per cent moisture has any chance whatever to win in such a contest, provided the competition is at all keen.

REPORT OF SPECIAL COMMITTEE ON SMALL GRAINS.

Since receiving the appointment as a special committee on small grains I have given the proposition referred to me, namely, to report upon a plan for premiums and conditions for growing and exhibiting small grains that would insure a uniformly superior grade of seed, considerable attention and have come to the conclusion that so far as small grains are concerned we are not now in a position where we can safely say that any particular variety or type is the best and the writer of this report hesitates to make any specific recommendation excepting that first of all variety tests of oats and other small grains should be made to determine if possible certain fundamental facts and that then the Association should so shape up its premium list as to emphasize the important factors in grain production.

Variety tests are already being made by the Experiment Station and the same thing could be done under direction by the members. It can be said that the thing of prime importance is the largest production of food material per acre. It is the one thing we are striving for but in order that this point may be reached in the shortest possible time I recommend that the proposition before this special committee be referred to the Seed Breeding Committee for consideration and report.

Respectfully submitted,

LEON S. MERRILL.

This report was followed by a general discussion.

DR. RAYMOND PEARL—It seems to me that the thing to be done first is to find out the varieties of small grain best adapted to meet the local conditions of soil and climate in various sections of our State. I feel that the Station can best

A Large Crop of Beans Grown in Maine.

serve the people of the State in this respect by continuing and extending the variety tests with oats which it already has under way. I wish to endorse the report of the special committee on small grains, and to invite the members of the Maine Seed Improvement Association to co-operate in a state wide variety test of oats now being inaugurated by the Experiment Station. We can put in the hands of a few farmers in different sections of the State enough seed oats for each to plant 1-4 acre of each of four varieties. The seeds will be recleaned and formaldehyde treated, and will be pure and true to variety name. A Station representative will visit the plats during the season and full and accurate reports of the results will be made from time to time. After continuing such state wide tests as these for a period of years it will be possible to advise a farmer in any section of the State just what will be the most desirable variety of oats for him to grow.

On motion of Dr. G. M. Twitchell the report and proposition made by Dr. Pearl were referred to the Executive Committee.

Following this discussion the program was resumed and Mr. C. W. Barber, Field Agent of the State, presented the following paper:—

THE WORK OF THE ASSOCIATION DURING THE PAST YEAR.

To Members Maine Seed Improvement Association:

Since the first of May, 1911, the greater part of my time as Field Agent in charge of seed and plant improvement work in the Department of Agriculture has been taken up in work with members of the Maine Seed Improvement Association. During this time I have been to the farms of 143 members and of these 25 were called upon twice. This organization was formed in 1910 for the purpose of promoting the agricultural interests of the State by establishing more cordial relations between the farmers; thus enabling them to act unitedly for the betterment

of rural pursuits 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; by distributing literature bearing upon the work of the Association and other agricultural investigations, and by holding an annual meeting for the discussion of topics and experiments beneficial to the members. Relative to these various purposes of the Association, I will endeavor to explain the work of the Field Agent and the problems encountered in plant improvement. In my visits to farmers of the Maine Seed Improvement Association my object has been to get a general idea first of the man, and second, of the farm which he operates. In order to be a successful seed grower a man must first be a good farmer. Unless one has some idea of what constitutes the principles of plant selection and of the benefits which will come to him in the growing of superior seed, it is a pretty difficult matter to make of him a successful seeds grower. He must be interested in his work and the possibility of advancement through intelligent management of his farm. Every member of the Seed Improvement Association ought to carry on his farm according to some definite system and that system should embrace crop rotation. No man can keep his land clean and free from weeds unless he cultivates the soil every few years. On many of our farms we find men plowing up small fields within large areas, that is, taking, as is often done, a piece in the middle of a large hay field. From this location of his cultivated field this year he will go to some other part of the hay field to plant a hoed crop the next year. The result is an unsystematic plan of cropping. Observation will teach almost anyone studying Maine agricultural conditions that much of our trouble with weeds comes first through this unsystematic method of cropping. Clean fields mean everything to the grower of crops for seed, and with this aim in view, and knowing as we do that cropping systems based on a definite rotation are producing the best results in the Old World and in the better farming regions of this country, it would seem that the seeds grower cannot hope to gain the greatest success unless he has in mind a definite system of rotation.

I believe that farmers and educationists in Maine must realize more than ever today that in order to better our condi-

tions as an agricultural State, we must work together and get back to the soil as nearly as possible. Every farmer whom one meets in this work has some experience which is valuable to his neighbor. There is no man who can work by himself, entirely dependent on his own resources, amid our average rural surroundings, and experience all of those things which go to make up a successful life. In other words, each one of us grows and develops by learning the experiences of others. If we can collect the experiences of farmers who have been successful in the growing of certain crops and find among a large number of farmers that they have in common certain methods or ways of handling these crops, we can feel certain that through the practice of these methods we will be far more certain of winning success. And in its purpose of establishing more cordial relations between farmers, this organization can be of the greatest value to Maine. So whoever the Field Agent of this Association may be, every farmer with whom he comes in contact ought to assist him in bringing out the best and most practical points regarding the production of certain crops. Let this Association become a clearing house of the practical experiences of farmers most successful in the production of various crops.

The second purpose of this Association is to carry on investigations and experiments in growing new and superior varieties of farm seeds and plants. In taking up this purpose, perhaps it would be well to deal with the various crops in which we are interested. We will take up corn first. It is interesting to note in the census figures for 1879 that the State of Maine grew 30,997 acres of corn; in 1889, 10,891 acres; in 1899, 16,856 acres, and in 1909, 15,558 acres. The total yield in 1909, the census figures give as 667,089 bushels or an average yield of 43 bushels per acre; a value of $28.70 per acre. In many respects, corn is a valuable plant for us to grow, that is, in the sections where it can be grown. Corn in a rotation affords a crop well adapted to clean cultivation and hence aids in keeping the land free from weeds. Land which will produce 35 bushels of oats per acre will easily produce 50 to 60 bushels of corn. Taking 60 cents as the average value of oats per bushel we have a return of $21 per acre for the oats and at 65 cents a bushel for corn we have a value of $32.50 to $39.00. Of course it will cost considerably more to produce a crop of corn, but we must

grow a cultivated crop in order to clean the land, and corn is one which often makes most valuable returns. The difference between the value of the oat straw and corn stalks for feeding purposes would be in favor of the corn. Again, the possibilities in corn production are far greater than with oats or other grains. It is comparatively easy to get a yield of 75 bushels of shelled corn per acre in the State of Maine. The same methods would not produce, ordinarily, 75 bushels of oats or any other grain. Here, again, we must not forget the difference in cost of growing. Just how much more it costs on an average to grow corn than oats is a question yet to be determined. However, the two crops serve different purposes. In the minds of many, flint corn is of course the most valuable one for us to deal with at present. It is native to New England, adapted to our climate, and generally may be looked upon as being the most certain type of corn to mature in our State. However, varieties of flint corn are often expected to do far greater things, even by our more intelligent farmers, than reason should teach that we should expect. It is no uncommon thing for farmers to send to Connecticut, Rhode Island and Massachusetts and even New Hampshire (that is, southern parts of that State) and expect to mature a crop from such seed during the first season it is grown in Maine. Every one of us has experienced, and perhaps quite forcibly and at a loss, that corn taken from a southern region and planted even fifty miles farther north, fails to mature as we should desire. Members of the Seed Improvement Association who are attempting to grow corn for seed purposes ought to carefully examine all of the corn grown in their own locality, watch it grow during the season, and if any variety appears to be good and strong, select that as the one to be improved. I should do this for the reason that any variety of corn that has been acclimated to the region and the soil in the town where you live will be far more certain to produce a crop. In seed improvement we are not after ideals alone but we must look at the dollar side of the proposition. We want the corn that will mature. According to literature which has been sent out by the Association, it is advised that farmers should carry on the ear-to-the-row test system of improving corn. In most instances it has been advised to select ten ears. In this ear-to-the-row method of planting corn, what are we looking for? It is simply this:—What we want is

the ear of corn that gives a high yield this year; its progeny to give a high yield next year; and so on, the third year. If we succeed in finding an ear of corn which breeds true in this manner we are fairly certain that it is one containing the character of high yield so strongly that pollenation from many other plants cannot predominate over this one of high yield. Having found this one ear that breeds true, i. e., gives us a high yield, we can use it to cross with selected ears from our general field. We would allow the plants of this high producing ear to develop pollen and we would ensure that the plants from the other selected ears were fertilized with this pollen, by detasselling all the plants from selected ears. Some of you may have heard me state that I did not believe our method of selecting only ten ears of corn to try out in a breeding plat could be capable of giving us much success, and that success in a short time. What are the chances of finding one good ear of the character which we have in mind in selecting only ten ears? I think that ten ears is too small a number to deal with. Breeding on such a basis it would take years to attain our goal. We ought to select 25 or 30 ears of corn each year from our general field and try them out in the breeding plat; and we ought to have, separate from this entirely, another breeding plat planted entirely to the highest yielding ears in the plat of the preceding year. At the Experiment Station valuable work has been done in sweet corn breeding. It was found in their breeding work that only one valuable ear of corn that had firmly established the ability to produce high yields year after year was found in the selection of three or four hundred ears. Hence it would seem advisable for us to increase the basis of our selections in corn breeding. You know that corn cannot be inbred very closely, as we say. The best results, the highest yields, have been obtained by crossing. That is what we endeavor to do in our ear-to-the-row method of testing corn. In and in breeding in corn is illustrated in some of the types which we have in this State. This past season I was able to see the effects of in and in breeding in half a dozen different strains of twelve-rowed flint corn. One, especially, was markedly instructive. This type of twelve-rowed flint had been grown on the same farm continuously for twenty-eight years. The plants stood about 5 1-2 feet tall. The stalks were rarely over half an inch in diameter in the thickest portion. The leaves were narrow, and

although the field had been especially heavily dressed with manure the plants were very light green in color. The ears of corn were small in diameter, of short length, and the kernels not much larger than those of pop corn. In talking with the farmer I learned that his method of selecting corn was to select seed from the bin. He picked those ears which looked good, that is, had twelve straight rows of kernels, and I thought inclined to be a little bit fine in quality. That is, the characteristics of the ears which he selected did not indicate vitality and strength. He never paid any attention to the depth of the kernel, but simply went by the outward appearance of the ear. In the twelve-rowed flint corn we have quite markedly illustrated the fact that in this variety we find very few ears possessing waste space between the kernels. On the other hand, any one who has endeavored to select even ten ears of corn from a bin containing only eight-rowed flint, I believe will have experienced difficulty in finding ears which are compactly covered with grain. Is there not a great opportunity in breeding a variety of flint corn possessing twelve or more rows and kernels deep like our dent corn. The value of our native flint corn for ensilage is becoming greater each season in our dairy industry, for dairymen realize more than ever that corn which is glazed when put into the silo has a far greater feeding value than our western dent corn which simply reaches the silking stage in the latter part of August. In the one case we are putting in a food containing a large percentage of carbohydrates and in the other we are putting in mostly fibre and water. I have had a great many dairymen ask me during the past season where they could get a variety of flint corn that will mature in their section, and be fit to cut into the silo before the middle of September. I have always advised them to examine the corn fields in their immediate locality and endeavor to find a strain of corn that matured; that is, that has proved itself acclimated to the same region in which their farms are situated. The demand from dairymen for seed will increase year after year, if the price of feeding stuffs for the dairy remains at the same basis as today. More of our cattle feeds may be produced in Maine, and especially if farmers in the different counties of the State are able to procure strains of seeds that will be certain to produce high yields under good care and management. Each member of the Maine Seed Improvement Association should

endeavor to develop some one particular kind of seed so that he can be a distributor of good seed in the locality in which he lives. One of the greatest reasons why the average farmer does not sow better seed is because he does not know where to get it, and cannot get it. If he paid you the same price right on your farm, or only 75 per cent of the price, which he pays for the same seed to seed distributors, wholesalers, you would be making more than you do now and he would certainly obtain far greater value for his money.

Another branch of the corn industry which has received, in fact, less attention from the standpoint of seed selection than the growing of flint corn in Maine, is the production of sweet corn. Do you know that most of the sweet corn grown in the State of Maine has in years past been produced from seed that came from Connecticut and Massachusetts as well as southern New Hampshire? Such seed introduced from southern points rarely gives the yield and matures as early as seed which has been acclimated in the regions of our corn packing centers. Corn packers admit that the finest quality of corn canned in the State of Maine has for years been developed from Maine grown seed. The only reason why they do not use more of this Maine grown seed is because they cannot obtain enough. Members of the Maine Seed Improvement Association who are alive to the possibilities of growing sweet corn in the State of Maine must certainly realize that here is an opportunity to develop a special line of seed production. In each locality wherever there is a sweet corn canning factory, there ought to be one or two members of the Maine Seed Improvement Association who are growing sweet corn for seed to be planted in the vicinity of that factory. We already have two members of the Seed Improvement Association who are producing sweet corn for seed. One produced three acres this year and the other about six. One of the principal reasons why canners do not encourage farmers to grow their own seed is because most corn growers do not realize what quality means in canned corn. The average farmer in selecting corn will select an ear that looks big, has large kernels and comes from plants of good forage quality. In fact, he is inclined to select coarse seed and does not realize that a smaller ear with a larger number of rows of kernels of greater depth will often cut out more corn than the large ear of coarse type. It has been proved that there is very little difference in the two

types in regard to yield, but the quality of the corn is far superior in the type possessing a large number of rows and deep kernels. Along this same line of thought, observation teaches that a great many farmers must be paying a high price for the fodder from sweet corn when they plant seed so thickly and do not give each plant an opportunity to fully develop. Corn at 2 1-4 and 2 1-2 cents a pound makes a good proposition and the farmer should strive for cut corn and not for fodder. He can grow roughage in far greater quantities in other types of corn and at less expense. Often the production of sweet corn has been greater where the farmer uses a little fertilizer in connection with barn dressing than on barn dressing alone. Those farmers who are getting the highest yield of cut corn per acre, are using 400 to 500 pounds of a good, high grade fertilizer with 12 to 16 loads of dressing. In filling out, the kernels of the sweet corn take up phosphoric acid and potash and this increased weight in corn is often obtained during the last few days of the season. Here is an experience that might well be worth considering in our production of seed. If we find in our clearing house of experiences that the successful corn growers do use a little fertilizer and less barn dressing we can put this down as a valuable rule to follow. It certainly has reasonable arguments in its favor. It may be a good plan for members of the Seed Improvement Association to consider the possibility of becoming seed growers for a canning factory in this State. Find out what you can do.

Grains. In selecting grains our only method of improvement has been through the use of the fanning mill. Experiments carried on in Canada during nine years, in which light and also heavy, plump seed of the different grains were used, taught conclusively the advisability of sowing only the heaviest seeds of grain. In every instance the heaviest kernels gave the highest yield, the stiffest straw, and hence, the most valuable crops. Members of the Seed Improvement Association who are growing grain in any quantity cannot afford to get along without the use of some method of grading grain for seed. This is the easiest thing that we can do to improve our crop. This is a common experience among farmers, and hence, no farmer can afford to follow the practice of sowing light grain. I do not believe that it is a practical proposition for us to expect that members of this

Association will be able to carry on experiments in improving oats and other grains by selecting individual heads and crossing different types. This work would require too much detail, too much labor and often the recognition of strong characters could be gained only by an expert. I wish that it were possible for members of the Association to obtain from our Experiment Station farm strains of the different kinds of grain that would be certain of giving high yield. This is possible, or will be within another year, and every member of the Association who grows grain ought to endeavor to find out from the Experiment Station people the quality of any grains they may have for seed and if possible obtain some as a foundation for growing seeds. If these improved strains of grains could be distributed throughout the State, and grown by careful farmers, it would take but a few years before we would be on the same plane as the Seed Improvement Association of Wisconsin. Farmers must begin to look for better types of grains and inasmuch as yield is the great object in view they ought to encourage any one who is capable of establishing such strains in Maine.

The production of edible beans in the State of Maine is quite an important industry. The census figures for the year 1909 give the production of beans in this State as 87,565 bushels, an average of 24 bushels per acre. The cultivation of beans makes a valuable crop in certain localities, especially in a rotation system. To be sure it is a crop that requires a large amount of fertility but if one is able to grow 24 to 30 bushels of seed per acre it is comparatively easy to sell the same for seed purposes at $2.50 to $5 per bushel. In this State we have one variety of beans which is we might say typical or native to our State, that is, the old-fashioned yellow-eyed bean. This type is highly prized by many people, and it is difficult to obtain in many sections of the country, as a study of the seed catalogues reveals. A few of our members are interested in the production of this old fashioned yellow-eyed bean, and among these growers there are possessed ideas of three different types of this bean. We ought to determine what the Association shall recognize as the old fashioned yellow-eyed bean, in order that all growers could produce this type and market the same co-operatively in order to obtain the highest prices. The Experiment Station is doing some valuable work in the establishing of this yellow-eyed bean

and it may be expected that we will attain some good results from this Station work.

Potatoes. The production of potatoes in the State of Maine has become a specialized industry; one often giving the highest money returns per acre compared with other crops. The southern seed potato trade is one which we should cater to. This is due to the fact that northern seed always gives a higher yield in the South during the first year of growth than does seed that has been grown in the South for a year or more. This makes for us a special market. If the South were able to grow potato seed stock advantageously for its own regions there would not be this demand for northern grown seed. Members of the Seed Improvement Association who grow potatoes could easily contract with southern growers to produce seed stock of different varieties of potatoes and hence their crop would be sold before it is planted. I will speak of this in my closing remarks. The great trouble with the potato business today is that the same type may be covered by half a dozen different names, or even more. Too often a dozen different varieties of potatoes may be selected from the same bin. To any one who will produce a uniform, true to name, and high yielding potato there is open a large market. In our selection work with potatoes we have advised the selection of individual hills that possessed potatoes of uniform size, of a type that the market wants, and high yielding. It is certainly possible to obtain strains of potatoes that will give 400 bushels per acre where others would produce only 200.

No association can live simply through the possession of certain ideals and not through a consideration of a practical and financial outcome of their work. In order to develop we must grow crops, greater crops from the same area, and we must be able to market those crops. This past season our members have grown some very good crops but in many respects we have not obtained a market for them. It is quite possible that we are not yet ready to go into the business of selling seed, but in my mind as soon as we begin to realize that improvement in seeds will come immediately when each farmer realizes an increased return per acre from the production of seed, then we will expect this Association to reach its greatest development. It will take the financial improvement to bring about the production of better strains of seed. With this aim in view I have thought

about the following plan for the work of the Maine Seed Improvement Association. Would it not be possible for our Association to purchase seeds of grain from our state experimental farm or from farms in the northern section of the country where seed improvement has been carried on for years, and could we not place this seed, say enough for one acre, in the hands of each member of the Seed Improvement Association who can and will give it good care and make it the foundation of his business as a producer of grain seed. It can be done. This will give the farmer one acre of a superior strain of grain, provided the testing out of two or three years on his farm proves this grain to be superior. He need not sell any seed the first or second year but can sow all of it on his own farm the second or third, or enough for five or six acres we will say; and in two or three years more the Association will have something to sell. It will have seed of improved quality. This is of course dependent upon the production of the seed as grown in the State during the first year or two. You will see that by this method the farmer will be able to get a return from the sale of seed during the first year, and a far greater one during the second year.

In regard to potatoes, we might be able to do work of a similar nature. We ought to advertise in southern markets, communicate with southern farmers and potato seed dealers and learn of the type and varieties of seed stock which they desire. We could make a proposition somewhat like this: I am a member of the Maine Seed Improvement Association and will agree to plant seed of any variety that you desire, the number of acres that you wish, and at a stated price. All the seed of this stock which I plant I will guarantee to disinfect with formaldehyde for the purpose of killing scab. I will guarantee to use a high grade fertilizer, give my land good cultivation, and will keep the potato plants free from disease by spraying. I will also dig the potatoes not earlier than ten days after the tops die, in order that the potatoes will have had a chance to harden up. In addition I will guarantee to ship a uniform grade of crop and it shall be free from disease. The officers of the Association will have the power and authority to inspect all of my crop and will guarantee my statements as made in the contract. Something of the ideas outlined above would help to bring seed potato business to us. Only this fall we have had in the Department

of Agriculture inquiries from six different potato buyers of the South, requesting the names of potato growers whom we could guarantee as having extra fine quality of seed. This is a practical proposition.

Recommendations for the season of 1912. For any agent to call on 140 to 150 members of this Association in all parts of Maine is beyond reason if we expect him to do the most and get the best and quickest returns for this organization. We must concentrate our effort. Select two farmers in each county and with them carry out the plans and purposes of this Association. By working with only a few farmers it will be possible to secure seeds of pure strains of grains and other crops to start our experiments, and to inspect the crops on each farm three or more times throughout the season. More accurate data can be obtained and a more careful supervision exercised over the farmer's efforts in crop improvement. Again, each farmer will have seed to sell within a few years and will receive quick returns. When these farmers are started well in the methods of crop improvement, others in the same county may be co-operated with and the experimental work extended.

Before closing let me state that the success of this Association depends on the financial returns which we are able to get from the increased revenue to be derived from the sale of pure seed. If we cannot make a financial success in selling pure seed, we cannot obtain the greatest improvement in crops. If we do not find a market for our pure seeds, I do not believe that this organization can be of the greatest value to the State. Far greater development will ensue when we begin to realize returns for our efforts.

C. W. BARBER.

BEST TYPE OF FIELD CORN FOR THE MAINE FARMER.

Abstract of Discussion Opened by DR. G. M. TWITCHELL.

While we have grown corn for generations, the importance of selecting for a type has but recently been realized.

Admit that there is a type of dairy cow most in harmony with largest production and the general application of the lesson is recognized. There must be a type of stalk and ear of corn giving greatest feeding value at least expense, and to find this is the great problem facing the thinking corn grower. No man should be content with a yield per acre less than one hundred bushels of shelled corn. So simple is this problem that little credit attaches to any man who does not exceed this volume, yet the average of Maine is below forty bushels. With only fairly good treatment any good corn land can easily be made to yield this much or more. In 1909 an old field fertilized with 1000 lbs. of corn fertilizer gave 8600 lbs. of ears. In 1910 from one acre of old neglected land, where 1200 lbs. of fertilizer only was applied, the yield was 119 1-10 bushels of shelled corn, and in 1911, with 1500 lbs. of fertilizer to the acre, the yield, from one-fourth acre, was 64 full bushel baskets, yielding two weeks after breaking 59 1-2 lbs. of shelled corn from 70 lbs of ears. In neither year was any barn manure applied and the fact that in the three years only fairly good treatment was given the fields, justifies the claim for crop yield certain to be obtained. To get this, more attention must be paid to type.

If for the silo, then size of stalk, abundance of leaves and character of well matured ear must determine. If for the crib, then size, shape and regularity of ears and size of kernels become paramount. In either case maturity is necessary. Maine climate will not give us more than one hundred and fifteen days in which to mature the corn crop.

Interested in the seed problem, I want a rapid growing stalk of fairly good length,—though I care more for leaf development than for height,—stout and strong at the ground and tapering to the spindle. The ear should be set not more than thirty inches from the ground and I prefer twenty-four to twenty-six. Bear in mind that the location of the ear on the stalk has a direct relation to maturity, and it is an easy matter to extend or reduce the time necessary for maturity when selecting ears for seed.

I want one ear to a stalk, but I want one ear on every stalk, and if the germinating power of the seed used is what it should be, you should have very close to 20,000 stalks to the acre when planted in rows three feet apart with four kernels every thirty-six inches. When by selection and skill in growing we reach this yield of one ear to a stalk, all previous records will be broken. The man whose eye is fixed on two ears to a stalk is very likely to overlook the skips all about him.

One ear of 440 kernels gave me the past season, 430 stalks, and 400 ears, large and small. As this row was the only one of the breeding plat not detasseled, I shall rely upon it for seed the coming season. Those who claim to grow three, four and even six ears to a stalk, with every stalk carrying at least two ears, are never seen at our corn shows. It's so much easier to stay at home and tell what "I could have done." More attention should be paid the cob. I want a corn to mature its first trace of seed ears in one hundred to one hundred and five days, the cobs to be fully thirteen inches long, small, straight and even throughout. For size it pleases me to break a cob less rather than more than one-half inch in diameter. This is all eight-row corn. On that cob I want 440 to 460 kernels, even, broad, deep, close fitting at top and base, square and well rounded at top, so that as the cob dries, one row may be crowded out a little. Seeking the maximum of food nutrients per acre, many seemingly trivial matters become of great importance. Years of experience in breeding experiments convinces me that our greatest mistake lies in selecting seed from the bin or at husking time. In every field you can readily find two to five types indicating the crosses made in establishing the variety and the constant rebellion of nature against any attempted rigidity of methods. Two laws hold tenaciously, that of heredity and variation. Heredity is that law by which we attempt to fix specific characteristics, and variation is that law by which nature at-

tempts to assert its independence. All improvement comes through variation, not heredity, and wise is he who guards conditions and is able to seize the ear, or ears, showing improvement and then fix the newer and better type by a system of careful selection. If you are seeking either for type or largest production, you cannot afford to go far from home for seed. Sending out of the State for seed, or to those living under different soil conditions in the State, is a ruinous policy, simply for the reason that corn is so peculiarly influenced by environment. Better by far take what you have and gradually weed out the objectionable features, lengthen the ears, hasten maturity, and improve in every essential. The whole problem is in the hands of the individual grower.

I want corn yielding from eleven to twelve per cent protein, where the average is ten. Protein is the most valuable item of food in the corn, and yet we are not considering it when selecting our seed. I want my crib-dry corn to shell from 60 to 61 lbs. out of every 70 of corn on the cob, and this upon a 12 per cent water basis means 88 pounds of shelled corn out of every one hundred of corn and cob.

There is no question but that the application of 350 lbs. of good corn fertilizer, not less than 3 per cent nitrogen, the very last of July, at the last cultivation, between the rows, is the most profitable step for the grower to take, and pays an important part in fixing the protein content.

What shape of an ear do you want,—one long or short, tapering or cylindrical, one from the bin or from selected stalks in the fields? If you cling to the cylindrical type of ear in flint corn you will inevitably reduce length and possibility of yield. The score card as now arranged plays sad havoc with the utility corn crop. There is a symmetry to the well tipped cylindrical ear not to be found in the tapering, yet I would prefer the long ear with one-half inch of cob extending beyond the large well filled rows to the shorter fully tipped point.

In a five year test, the Ohio Experiment Station found that with five varieties the long ears produced an average of 3.97 bushels more corn than the short ears. I believe it more necessary that each grower have in his mind a type clearly defined, towards which he is working, than that he follow the type established by his neighbor.

Fortunately this problem rests upon a few simple propositions with a wide range for personal application. Work out your own type and then breed to it and for it. Don't go far afield in mixing types, else all your efforts will be futile. Select your seed in the field from strong vigorous stalks, but only those which answer your conception of type wanted. I am convinced that better seed will be grown on ground fairly well fertilized than on that heavily dressed. If you want gross yield of corn, get plenty of sunlight all about the hill, which means an open stand.

The yield in 1910 seemed impossible in early September because there was so much daylight through the field. If you want to produce seed ears which will yield heavily when planted, select good ears, even though the stalks were somewhat crowded, and soil conditions not entirely favorable. I like to break my seed ears just as the tips of the husks begin to dry and while the body is green, and feel certain of better returns next year than if fully matured. This is entirely contrary to common practice, but is a step to be tested by others. The past season it was not the kernels which germinated first when planted which gave the largest, strongest or earliest ears. There's a wide field open and yet unexplored before the thinking corn grower. One fact is certain, the man who fails to stamp his own individuality on his work will fail of a bumper crop. That man who starts to do something better in corn growing and follows his own best methods, will win out. One caution may be offered on this question of type and that is, to avoid all coarse, irregular shaped specimens. Whatever your idea of a good ear may be, let it be uniform throughout, of good length, the rows of kernels straight, well filled, large and full. Having these essentials the work of improvement is in your own hands and the type best suited to your conditions certain to follow.

DISCUSSION.

In the discussion following this paper one of the members expressed himself as somewhat opposed to the general proposition that each member should be encouraged to breed his own type of corn. This was replied to by the writer of the paper who stated that in his opinion such a plan would do more toward interesting the members of the Association in seed improvement

work and in the development of superior strains of corn from which later could be selected one or more strains that would best answer the needs of Maine farmers than any other plan he could think of. Dr. Twitchell was asked why he preferred selecting his seed when the tips of the husks are dry and the body green rather than from an ear fully matured. The answer was that he had been so advised by Mr. James J. H. Gregory— the veteran seed man— and had found by experience that it was the best plan, but that it was, of course, a thing for others to try out and demonstrate for themselves.

At this time Mr. Frank Lowell, special committee on potatoes, made an informal report which was accepted by the Association. It is impossible to print this report as no manuscript has been furnished the Secretary.

This report was followed by demonstrations in Corn Judging conducted by Professor W. L. Slate, Jr., University of Maine, and in Oat Judging conducted by Mr. E. A. Stanford, Farm Management Expert, West Kennebunk.

A judging contest in corn and potatoes for the Bell-Merrill cup was held in Exhibition Hall, which was participated in by nine of the members present and was won by Mr. Guy C. Porter, of Houlton, with an average score of 90.

Evening Session 7.30 O'Clock.

The evening session was given over to a most interesting paper by Professor M. F. Barrus, of Cornell University, which follows.

THE DEVELOPMENT OF DISEASE RESISTANCE IN PLANTS.

The extent of our natural resources appeals to the pride of every American citizen. We are proud of our extensive grain fields which keep not only ourselves but the whole world from hunger, of our splendid orchards producing many varieties of fruits of both temperate and tropical regions, of our magnificent forests which supply us with the timber needed for building and for use in the industries. We take pride in our

truck farms which supply our tables with succulent vegetables and in our floral gardens which give us an endless variety of ornamental and useful plants; and, in our pride, we feel that there is no limit to the variety and to the amount we are capable of producing. Yet if we but look a little more carefully we shall no doubt be amazed to find that ten per cent of the grain in these fields is ruined by smut, that twelve per cent of the fruit has rotted, and that fifteen to eighteen per cent of the timber is badly decayed and unfit for use. Our amazement increases when we find that the potatoes have blighted, the onions have mildewed, and the crysanthemums have rusted; and when we learn that there is scarcely a crop that is not affected by some disease, and several with many diseases. Statistics tell us that the annual loss from oat smut in the United States amounts to $6,500,000, and from wheat smut to $14,000,000, that the loss from grain rust in the three states of Minnesota, South Dakota and North Dakota amounted to $10,000,000 in a single year, and in New York State alone an equal loss resulted from timothy rust. In the year of 1905, the loss from potato blight in the State of New York amounted to $15,000,000 and the losses in other blight years have been heavy.

Of course, there are various ways by which plant diseases may be controlled, or held in check. Spraying with various fungicides has been demonstrated time and time again to be effective in preventing a large number of diseases if the mixture is thoroughly applied at the proper time; dusting with sulphur aids in reducing the powdery mildews; soil treatments may entirely exterminate the destructive organisms in the soil; the loose smut of oats and bunt of wheat are easily and cheaply controlled by treating the seed of the affected grain; parasitic soil fungi may starve out during a rotation in which the affected host does not appear except at intervals of three to five years; good cultural methods often do much in aerating the plants and the soil and thus prevent infection from taking place; often we may be able to avoid a destructive disease by planting seed selected from healthy plants, in a field known to be free from the disease. But many of these methods are expensive and some are only makeshifts at best. The more satisfactory way would be to obtain plants that would not

become affected by a disease even when exposed to it, just as some people are immune from an attack of measles, chicken pox, or yellow fever. I am pleased to announce that there is on record a number of cases of plants resistant to destructive diseases, that have been obtained by selection and by hybridization, and that these plants have apparently transmitted their resistant qualities to their progeny in succeeding years.

Before beginning a discussion of the methods by which resistant plants may be developed it will be well to discuss briefly the nature of fungi and bacteria and to point out the relationship which the parasitic forms bear to their host plants.

Fungi and bacteria are plants just as are the higher forms upon which they live. They are very much reduced in size and in most cases in their physiological activities because they are not capable of manufacturing their own food as the green plants do but live upon organic substances already produced. Bacteria are very small, simple, one celled organisms that increase by simple division of the body. They absorb directly through their walls the soluble food necessary for their growth and development. Fungi are characterized, for the most part, by having a vegetative body composed of thread-like strands called mycelium. Fruit bodies of various forms are produced by the different species and these bear or contain the spores or reproductive bodies of the fungus. These spores are distributed by wind, water, and other agents and upon germination reproduce the vegetative stage of the fungus.

Those forms of bacteria and fungi that live upon dead organic matter are called saprophytes and those that prey upon living tissue are known as parasites. The plant sustaining the parasite is regarded as the host. Some forms ordinarily saprophytic may become parasites if the plant attacked becomes weakened and conditions are particularly favorable for the development of the parasite. Such forms have been named facultative parasites.

It is, no doubt, well known to you that plant as well as animal tissue is made up of cells composed of protoplasm or living matter containing various organic and inorganic substances in solution or as solid particles. In most plants the protoplasm is surrounded by a wall of cellulose. An aggregation of these little box-like cells makes up a tissue which, in

higher plants, has definite functions to perform that may differ from those of other tissues of the same plant. The tissues of higher plants are protected externally by a layer of cells called the epidermis surrounding the entire plant. Many little openings called stomata permit the interchange of gases to and from the plant.

The application of the spores or other parts of the parasitic organism to the host plant is called inoculation. When the parasite has established itself upon or within the tissues of the host we say infection has taken place. The manner of infection is interesting and it differs with different organisms. In the case of the fungus causing bean anthracnose the summer spores germinate upon the surface of the bean plant and produce, at first, a roundish body with one surface closely appressed to the epidermis of the host. From its appressed side an infection tube is sent out which penetrates directly the epidermal cell, and, branching profusely, threads are sent into other cells whose contents are killed and absorbed by the fungus. Enough cells are finally destroyed so that a spot is noticeable at this point and we say the plant is diseased. The penetration of the wall of the cells by the germ-tube and the fungus hyphæ is made possible by the secretion of an enzyme from their tips which dissolves the cellulose cell wall at that point. Rust spores germinate in much the same way except that the germ tube of the uredo spores enters the host plant through the stomata. The mycelium of the rust does not penetrate the cells, but instead little branches or suckers, called haustoria, are pushed in and these absorb from their contents the food necessary for the nutrition of the fungus. In this case the host cells are not at first killed, but continue in a healthy condition as the fungus does not secrete poisonous enzymes nor does it absorb so much nutrition from the host cells as to inhibit their function during the earlier period of the growth of the plant.

In many cases the parasite is not at all times able to gain entrance to the host plant. Favorable conditions must obtain for the germination of the spore and the entrance of the germ-tube if infection is to take place. Such conditions are not the same for all fungi. The temperature factor may vary, but for the most part, moisture in the form of rain, dew, or

saturated atmosphere is necessary if the spores are to germinate. Some soil fungi, like the potato scab organism, require an alkaline condition and the addition of acid phosphate to the soil is decidedly detrimental to them, while others require an acid condition for their best growth. It may be said with due emphasis that whatever tends to remove or to diminish the conditions favorable for fungus attack will prevent or decrease infection from those organisms.

Not all fungi affect their host plant to the same extent. The seed fungus of Lolium passes its entire existence within the host plant without causing injury to the host, indeed stimulating it if anything, to increased growth. The rusts seldom cause serious injury to their host at first, though later when their development is nearing completion they may cause a great reduction in yield and may even injure the host to such an extent that no seed is produced. This ability of the rusts to live within the host without causing injury is of great advantage to the fungus as it is not able to extract its food from dead tissue. Many lower fungi, as those causing damping off of seedlings kill outright the tissues they attack. Such forms are able to pass a portion of their existence as saprophytes, and certain fungi, ordinarily saprophytes, may become parasitic, as mentioned before, if conditions are particularly favorable. These usually attack weakened or detached parts of plants, such as the fruit, tubers, etc. Thus we find the common blue-mould causing a rot of apples in storage and the bread-mould rotting sweet potatoes.

Some fungi are cosmopolitan in their nature and may attack many different kinds of plants, but most parasitic organisms are more restricted in their range. Fire blight, a common and destructive disease of pears, is confined to a few plants of the rose family. The club root, a serious disease of cabbage and turnips, and the white rust of crucifers occur on quite a large number of species within the mustard family. The smuts are extremely common on cereals and occur also on a few other plants, but each species of smut occurs on a single host plant. Compare the loose smut of wheat with the loose smut of barley. Both occur at the flowering time of the grain affected; both completely destroy the inflorescence, reducing the head to a dusty mass of black spores; they are similar in their develop-

ment, each infecting the flower of its respective host and thus greatly differing from other smuts. The spores of the wheat smut dusted on the flowers of wheat will infect the grain which, if planted, will produce smutted plants, but if the spores of the barley smut are dusted on the wheat flower no infection will result, nor will any if the spores of wheat smut are introduced onto the barley flowers. The various rusts are likewise strictly confined to the host species they normally attack and they may become so specialized as to infect certain varieties within the species, the other varieties being partly or entirely immune. Salmon (1) found that certain Erysiphæ (powdery mildews) had become so specialized that, while the same species of mildew was found on a number of different hosts, the form on one would not attack the others. These forms, physiologically different, though anatomically alike he calls "biologic forms". The writer in his infection work with the bean anthracnose fungus, found that a given strain of the organism will attack certain varieties of beans and will not infect certain other varieties, yet if another strain of the fungus is used the results may be entirely different.

Some varieties of plants are, year after year, never attacked by certain parasites, simply because they have their period of growth and reach maturity before the parasite makes its appearance. Varieties that appear later are attacked, as these would be if they were later in their growth or if the parasite were earlier in its appearance. Oats sown early usually escape the rust, and some early varieties of potatoes are nearly mature before the advent of the late blight organism but on the other hand they are liable to attack from the early blight. In some regions where the early blight is prevalent it is the custom to plant potatoes as late as possible in the season in order that they may escape this disease. Such varieties Orton (2) calls "disease-escaping plants." Nevertheless it is true, as numerous instances prove, that certain varieties even when they are subjected to disease conditions will become affected but slightly or not at all while other varieties of the same species of plant

1. Salmon, Ernest S. Cultural Experiments with Biologic Forms of the *Erysiphaceae*. Proc. Roy. Soc. *73* : 116-118, 1904.
2. Orton, W. A. The Development of Farm Crops Resistant to Disease. Year Book U. S. Dept. of Agr. 1908 : 1. c. 458, 1909.

will become badly affected. A notable example of this is the Iron Cowpea (3) which is resistant to the attacks of the wilt and of the root knot, two diseases caused by soil organisms that very severely attack most other varieties. This variety when grown upon soil badly infested with either disease retained its vigor and produced a normal crop, but other varieties as the Black and the Wonderful, grown in rows on either side of the Iron became badly infested and produced no crop at all. In succeeding years this Iron Cowpea has retained its disease-resistance quality and has proved to be a valuable variety on infested soil. In case the resistant variety does not possess other desirable characters it may be crossed with a desirable related variety in a manner pointed out later.

Now and again individual plants of a desirable, though susceptible variety may be found resistant or entirely immune to the disease ordinarily affecting the plant. Seed from these resistant plants sown the following year where the plants may be subject to inoculation from the parasite, have produced plants showing high disease-resistant qualities. This indicates that disease resistance is an inheritable quality and after a few years' selections in which non-resistant plants are weeded out, individuals possessing a high degree of resistance may be obtained which may be depended upon to transmit this quality to succeeding generations.

A very important point must be kept in mind. To be certain that a plant possesses the quality of resistance it must be free from disease after having been subjected to the parasite under conditions favorable for infection to take place. One may be reasonably sure that a plant possesses such a quality if it appears resistant to a disease that has badly affected neighboring plants of the same variety. To be certain, however, that disease resistance in each case has been transmitted the progeny of the plant should be subjected to the disease in succeeding years. If the disease is not prevalent in succeeding years it may be necessary to artificially inoculate the plants with the organism causing the disease.

---

3. Orton, W. A. Plant Breeding as a Factor in Controlling Plant Diseases. Am. Breed. Assoc. Rept. *1* : 69-72, 1905.

Bain and Essary (4) of Tennessee have obtained an anthracnose-resistant clover by the selection of individual resistant plants from fields where many plants became badly affected. For a number of years they have been testing the progeny of such individuals and selecting others until they are confident they have a strain possessing a high degree of resistance to this disease.

Blinn (5) of the Colorado Agr. Expt. Station has obtained by selection from a large number of plants, a strain of cantaloupes resistant to leaf blight, a disease serious in that region.

Orton (6) reports that Rivers and Sensation Sea Island Cotton obtained originally several years ago by the selection of a resistant type, has remained resistant to the wilt disease ever since. The Dillen and Dixie wilt resistant strains of Upland Cotton were obtained in the same way.

Bolley (7) of North Dakota reports that he has obtained by selection strains of flax resistant to wilt.

Stuart (8) of Vermont has developed varieties of potatoes partially resistant to late blight and possibly also to scab.

The great advantage of this method of breeding is that the plants already possess other desirable fixed characters while in hybridization such desirable characters are broken up and recombined.

Oftentimes, however, it is impossible to obtain a desirable resistant variety or to find even by careful observation any individuals of a desirable variety that show marked resistance to disease. It has been found possible in crossing a desirable but susceptible variety with a closely related resistant but otherwise undesirable plant to secure in the progeny of the second generation some forms which possess the desired characters, including that of resistance to disease. The first gener-

---

4. Bain, Samuel M. and Essary, Samuel H., Selection for Disease-Resistant Clover. Tenn. Agr. Exp. Sta. Bul. 75 : 1-10, Figs. 1-5, 1906.
5. Blinn, Philo K. Breeding Cantaloupes. Am. Breed. Assoc. Rept. 4 : 165-172, 1908.
6. Orton, W. A. The Development of Farm Crops Resistant to Disease. Year Book U. S. Dept. of Agr. 1908 : 1. c. 463, 1909.
7. Bolley, L. H. Breeding for Resistance or Immunity to Disease. Am. Breed. Assoc. Rept. *1* : 131-135, 1905.
8. Jones, L. R. and Stuart Wm. Disease Resistance of Potatoes. Vt. Agr. Expt. Sta. Bul. 122 : 107-136, 1906.

ation after the cross may be an intermediate between the two parent forms and is susceptible to disease, but in the second generation a large number of forms are produced in which all possible combination of characters may be found. Biffin (9) in his work on rust-resistant plants found the proportion of resistant plants to susceptible ones to be as 1 to 3, indicating that resistance is recessive to susceptibility. Of course, in the recombination of characters, a large number of the plants possessing resistance will be found to have inherited some of the undesirable characters possessed by one of the parents, but the chances are good that a few plants satisfactory in all respects may be found. The seed from these should be saved and all undesirables discarded. The following year this seed should be planted where the plants will be subjected to infection and treated in all respects as outlined above for the resistant plants obtained by selection alone.

The disadvantage of this method is that if the parent plants differ markedly in their various characters so many combinations result in the progeny that it is difficult to obtain a satisfactory plant except after several years of breeding. Orton (10) calculated that the chance of securing a desirable individual in the case of a cross between a watermelon and a citron was as 1 to 4096. Yet he obtained such a desirable plant after a second cross between the hybrid and the watermelon and such plants are to-day able to grow upon soil infested with the wilt fungus. Biffin (9) was able to obtain desirable strains of wheat immune to the yellow rust by crossing immune but otherwise undesirable varieties with susceptible varieties possessing other characters he wished to perpetuate.

In most of the cases of disease-resistant plants obtained either by selection or by hybridization, the plants are not completely immune. The disease against which they have been bred to be resistant may appear on them in reduced form. They are, however, practically immune and the danger resulting from an attack is reduced to a minimum, in fact, as much as is usually obtained from successful spraying.

---

9. Biffin, R. H. Studies in the Inheritance of Disease Resistance. Jour. Agr. Sci. *2* : 109-128, 1907.
10. Orton, W. A. On the Theory and Practice of Breeding Disease-Resistant Plants. Am. Breed. Assoc. Rept. *4* : 144-156, 1908.

A plant may be resistant to two or more diseases, or may be resistant to some and subject to others, indicating that disease-resistance is specific. Thus Orton (11) cites Centerville cotton as being resistant to wilt, and also to black arm, Rivers resistant to wilt, but susceptible to black arm and Iron cowpea as immune to wilt, root knot, and Cerocospora leaf spot, but subject to powdery mildew and other fungous leaf spots.

It has been noted by various workers in obtaining disease-resistant plants that plants bred to be resistant to a certain disease in one locality have been susceptible to this disease when transferred to another locality where soil and climatic conditions are different. Bolley, (12) in speaking of wilt-resistant flax, says that "A particular strain bred to resistance is resistant for that particular grade of sick ground upon which it is developed but may vary upon different soils," and that "A certain percentage of wood ashes added to the soil is sufficient to break down the resistance which is otherwise perfect."

The writer in the pursuit of his investigations on the anthracnose of beans artificially inoculated a large number of varieties to determine their susceptibility or resistance to this disease. He found eleven varieties of kidney beans that were apparently quite resistant or entirely immune. These, later in the year when inoculated with a strain of the fungus from an entirely different source proved to be as susceptible as any of the others, and what is most surprising, the varieties Navy Pea and Golden Refugee, which had given excellent infection to the first strain gave slight or no infection when inoculated with the second strain. This indicates that not only do the hosts vary in constitutional ability to resist infection, but the parasite itself varies in its power to infect. Subsequent experiments confirmed the reliability of these results. It would seem, therefore, that it is not safe to conclude because an individual, a strain, or a variety is resistant from one inoculation and in one locality that it will continue to be resistant from other inoculations and in other localities, and the reason thereof

---

11. Orton, W. A. On the Theory and Practice of Breeding Disease-Resistant Plants. Am. Breed. Assoc. Rept. *4* : 144-156, 1908.
12. Bolley, L. H. Some Results and Observations Noted in Breeding Cereals in a Specially Prepared Disease Garden. Am. Breed. Assoc. Rept. *5* : 177-182, 1909.

may not always be due to a difference in soil or climatic conditions and its consequent effect upon the host plant but is as likely to be due to the presence there of another strain of the fungus. It may be that some plants now heralded as immune to certain diseases would become susceptible if attacked by a strain of the fungus from another source.

The writer has not found any varieties of the kidney bean, *Phaseolus vulgaris,* that have been resistant to every strain of the bean anthracnose fungus tested. Some varieties are less susceptible than others and it may be that certain varieties not yet tested by the writer may prove entirely immune. The writer does not wish to intimate that he believes no varieties of beans are immune to anthracnose or that the numerous examples of disease-resistant plants that have been obtained by careful and painstaking selection and hybridization, are liable to infection from those very diseases they are supposed to be proof against. We do need, however, to use every safeguard against error in this most important work.

It would seem improper to close without a word regarding the cause of immunity in plants. Not that we have anything definite to contribute, but because speculation regarding it is interesting. Several investigators though their work have done much to clear away confusing ideas and to present something logical. It was once thought that the stucture of the immune plants differed in some way from that of the susceptible ones, so that penetration by the parasite was impossible. The opinion of Marshall Ward, Salmon, and many plant pathologists is that the structure of the plant in most cases has very little to do with immunity. Ward (13) showed that immunity in the case of those plants affected by the Brome Rusts was due to the very vigor of the parasite itself, which attacked and killed the host cells. As it is unable to live upon dead tissue it has by its very activity deprived itself of its source of nutrition and consequently dies before it has established itself within its host. Salmon (14) has shown in the case of plants immune to

13. Ward, Marshall H. Recent Researches on the Parasitism of Fungi. Ann. Bot. *19* : 154, 1905.

14. Salmon, Ernest S. On Raising Strains of Plants Resistant to Fungous Disease. Roy. Hort. Soc. Rept. 3rd Inter. Conf. on Genetics 1906 : 378-384, 1907.

Ersiphe, fungi causing powdery mildews, that the haustoria of the fungus penetrates the cells, but that the plants "by means of certain physiological processes" were able to prevent "the attainment of that balance whereby working relations between the haustoria and the host cell are brought about and maintained." It is also stated that the host cells of immune plants secrete certain enzymes that are toxic to fungous mycelium or antitoxins are secreted which neutralize or overcome the toxins secreted by the fungus.

Certain it is that the repulsion of the invader is from within in most cases and is effective after the parasite has gained entrance to the host and, what is most fortunate, this property is capable of transmission from one generation to another.

Forenoon Session, November 23.

The morning session of the Association was called to order by the President and the order of business taken up.

Report of the Committee on Corn Zones presented by Dr. Raymond Pearl, Chairman, followed.

This plan is drawn up merely as a suggestion as to the location and extent of these zones. All parts of it are open to discussion and criticism. The State shall be divided in three zones called the Northern, Middle, and Southern Zones.

The boundaries of these zones shall be as follows:

The *southern boundary of the Northern Zone* (which also is the *northern* boundary of the Middle Zone) shall be a line starting at the extreme southwestern point of Hancock county and following the western boundary line of Hancock county north until this boundary leaves the Penobscot River and then due north to Bangor. From this point (Bangor) it shall turn westward and run in a straight line to the town of Dexter; thence it shall turn southwest and run to the town of Skowhegan; thence it shall run westward to the town of Norridgewock; thence northwest to the town of Phillips; and thence due west until it meets the New Hampshire line.

The *whole* of the following counties shall then be in the Northern Zone; Washington, Hancock, Aroostook, Piscataquis. A major portion of each of the following counties is also in this zone; Penobscot, Somerset, and Franklin. All towns

through which the *boundary* line, drawn as above described, *passes* shall be in the *Northern Zone*, except the town of Strong, which shall be in the *Middle Zone*.

The *southern boundary of the Middle Zone* (which also is the *northern* boundary of the Southern Zone) shall be a line forming the northern boundaries of Knox, Lincoln, and Sagadahoc counties as far west as the northwest corner of the town of Bowdoin. Thence the line shall run southwest to Lewiston and thence to Poland. From Poland the line shall be the northern boundary of Cumberland County as far west as the town of Bridgton. From Bridgton the line shall proceed due west to the town of Fryeburg, where it meets the New Hampshire line.

The *Middle Zone* will then contain all of Waldo and Kennebec counties, and parts of Penobscot, Somerset, Franklin, Oxford, and Androscoggin. All of the towns (whether named or not) through which the boundary line passes shall belong to the *Southern Zone*.

The *southern boundary of the Southern Zone* shall be the southern boundary of Knox, Lincoln, Sagadahoc, Cumberland, and York counties.

The *Southern Zone* shall include all of Knox, Lincoln, Sagadahoc and Cumberland counties, and a part of Oxford and Androscoggin counties, together with the boundary towns named.

The report of the above committee was accepted and the plan proposed adopted for the coming year.

The expense account of President Hunton incurred while in attendance at Augusta during the session of the last Legislature in securing the passage of a resolve in favor of the Seed Improvement Association was presented and the Association ordered the bill, amounting to $14.75, paid.

REPORT OF COMMITTEE ON RESOLUTIONS.

Your committee desires to report the following resolutions to the Association:

Resolved: That while the Association shall continue its special work with corn, potatoes, and small grains it shall also undertake more definite work with beans and such other crops as vegetables, vetch, and alfalfa, the plan of such work to be outlined by the Executive Committee.

Resolved: That in the opinion of the Association the most urgent need at the present time for the improvement of the crops of Maine is to obtain exact scientific knowledge as to what varieties or strains of seeds of our common crops are best suited to the local conditions of soil and climate in different parts of the State. To this end the Association would recommend the carrying out as soon as possible of accurate, scientific, and widely distributed variety tests of the best strain of seed now to be obtained in any part of the world. As a beginning of this work the Association would endorse the co-operative variety tests of oats now being conducted by the Maine Agricultural Experiment Station, and desires to record its willingness to co-operate in these tests, and would urge the extension of such tests to other crops at as early a date as may be feasible.

Resolved: That the Association recognizes and hereby expresses its appreciation of the impetus given to the promotion of the objects of this body, and the service rendered to the agriculture of the State by the Maine Corn and Fruit Show, and those who planned and executed it.

Resolved: That the Association shall keep in close touch with and give its support wherever and whenever possible to the efforts now being made to secure Federal aid in behalf of agriculture in each state;

Resolved: That the Association endorses fully and heartily the objects for which the Maine Federation of Agricultural Associations has been formed, and that it will elect at this time as many delegates to the Federation as its membership allows.

Resolved: That it is the opinion of this Association that the present tendency to multiply separate agricultural exhibits in the State is unfortunate, because of the expense in time and money involved, and because of the distribution and dissipation of interest consequent upon holding many small exhibits widely separated as to time and place. It is our opinion that such interests will be more efficiently furthered by a policy of concentration rather than one of separation. Therefore the

Association hereby instructs its delegates to the Maine Federation of Agricultural Associations to bring before that body for consideration the question as to the desirability of the consolidation of the existing state wide agricultural exhibits into a simple exhibit to be held under the joint auspices of the several associations composing the Federation, and such other associations and organizations as may wish to co-operate in this work, it being understood that no part of this resolution applies to Agricultural Fairs. Pending the settlement of this question it shall be the policy of the Association to make no exhibit before the time of the next annual meeting.

Resolved: That owing to the difficulty, under present conditions, of bringing about such frequent and fully attended meetings of the Executive Committee as is desirable for the most efficient promotion of the interests of the Association, it is advisable at this time to amend the Constitution by striking out of Article V, Section 2, the word "five" and substituting therefor the word "three".

Resolved: That the Executive Committee is hereby instructed to consider carefully the question of premiums and methods of offering premiums at the future annual meetings or such other exhibits as the Association may participate in, with a view to formulating a plan whereby emphasis in making awards shall be placed upon type, yield, and adjustment of crops to local conditions.

Resolved: That the interests of the Association can be better advanced by the election at this meeting of a visiting member to the College of Agriculture of the University of Maine, and the Maine Agricultural Experiment Station, said visiting member to give his time and the Association to pay his expenses.

Resolved: That the Executive Committee be empowered and instructed to plan and as soon as possible embark upon an agressive campaign to bring to the attention of the public the merit of the seed now grown and available for sale by members of the Association;

Resolved: That the Association hereby expresses its warm appreciation and hearty thanks for the aid which has been given it, both in respect to this meeting and in other ways by the Waterville Board of Trade, the Maine Central and Bangor and Aroostook railroads, and the newspapers of the State.

The above report was accepted and the recommendations adopted.

Mr. Ralph P. Mitchell, instructor in Agriculture at Kent's Hill Seminary, asked the privilege of presenting to the Association the matter of boys' and girls' agricultural clubs, which he did in a most interesting and effective manner. The Association voted to give encouragement to this movement, in so far as it was able.

It was voted to proceed with the nomination and election of officers. The following persons were nominated for the several offices:

President—W. G. Hunton, Readfield.

Vice-President—A. P. Howes, Palmyra.

Secretary—Leon S. Merrill, Orono.

Treasurer—C. M. White, Bowdoinham.

Executive Committee—Guy C. Porter, Houlton; R. T. Patten, Skowhegan; G. M. Twitchell, Auburn; Frank Lowell, Gardiner; L. C. Holston, Cumberland Mills.

As only one candidate appeared for each office it was voted that the Secretary cast the vote of the Association for the nominees. This was done and the President declared them elected.

The Secretary was requested to report on the organization of the Maine Federation of Agricultural Associations, which he did as follows:

Complying with the direction of the Maine Seed Improvement Association made at its last annual meeting the Secretary called a meeting of representatives of the various agricultural organizations in the State to meet at Augusta on the 18th of January, 1911. At that time representatives of the different organizations in the State assembled in large numbers, and after a full discussion of the whole proposition it was voted to organize a Federation of agricultural organizations state and county wide in their scope. A special committee was elected to draw up plans for organization, and directed to report at a later meeting to be held at Augusta February 8th at 10.30 o'clock in the forenoon. On that date representatives of the various agricultural organizations again convened and the organization was completed, the principle features of which are as follows:

1st. *Name*—The Federation is known as the "Maine Federation of Agricultural Associations;"

2nd. *Object*—The object of the Federation is to so unite the various agricultural organizations in the State that all may work in harmony for the best interest of agricultural betterment;

3rd. *Membership*—The membership in the Federation shall consist of such agricultural associations, societies, organizations, departments, and institutions (state and county wide in their operation) as may from time to time be elected to membership;

4th. *Basis of Representation*—The basis of representative membership in this Association shall be as follows—each association or society shall be entitled to one representative and one additional representative for each one hundred members, not to exceed three members for any organization. The Department of Agriculture, College of Agriculture, and Experiment Station shall each be entitled to two representatives. Representatives shall be elected or appointed for the period of one year, except in cases where vacancies occur, when the election or appointment shall be for the unexpired term;

5th. *Dues*—The annual dues, payable by each member of the Federation, shall be $2 for each represenative it has in the Federation. Said dues shall be payable in advance on or before the annual meeting in each year;

6th. The following organizations, associations, departments and institutions were represented:

Maine Dairymen's Association,
Maine Live Stock Breeders' Association,
Maine Pomological Society,
Maine Seed Improvement Association,
College of Agriculture,
Maine State Poultry Association,
Maine Agricultural Experiment Station,
Department of Agriculture,
Maine State Jersey Cattle Association,
Maine Creamerymen's Association,
Maine State Grange,
Maine Sheep Breeders' Association,
Oxford County Fruit Growers' Association,
Sebasticook Valley Holstein Breeders' Association,
Oxford County Holstein Breeders' Association,
Aroostook Jersey Breeders' Association,
Androscoggin County Holstein Breeders' Association.

7th. It was voted to establish a Hall of Fame at the Agricultural Hall, University of Maine, in which there shall be erected from time to time tablets to the memory of farmers and agricultural workers who have, during their lifetime, contributed in large measure to the promotion of agriculture in the State of Maine; and it was also voted that the first tablet should be erected to the memory of Dr. Ezekiel Holmes.

The report of the Secretary was accepted and the organization of the Federation approved.

The following representatives were elected to the Maine Federation of Agricultural Associations: W. G. Hunton, Readfield; A. P. Howes, Palmyra.

W. G. Hunton, Readfield, was elected visiting member to the College of Agriculture and Experiment Station.

At this point the educational program was resumed by the following paper.

WHAT TYPE OF YELLOW-EYED BEANS SHALL WE GROW.

A. P. Howes, Palmyra.

As I view the yellow-eyed bean situation so far as it concerns this Association it seems to be somewhat complex and perhaps is no nearer a solution than one year ago. There are almost as many different types of old fashioned yellow-eyes as there are growers and correspondingly as many stores and seed houses in Maine where these different types are bought and sold. If I am informed correctly there are four members of this Association who are interested in the production of a pure strain of old fashioned yellow-eyes. Among these four members are three distinct types and each one of these is bought and sold as old fashioned yellow-eyes at the leading seed houses in Maine. Personally, I am growing two different varieties, one the same as those grown by Mr. Austin of Danville, the seed of which I procured from President Hunton in Readfield; the other is identically the same as those grown by Mr. Files of this city. I find by experience that the Readfield or Austin bean shows a marked tendency toward degeneracy; that is, after the seed planted in the spring has been carefully selected so as to secure a uniform type, there appears two other types, one the little pea bean, the other similar to the Morse bean which is the predominating one. So it is evident to me that this bean has been bred up from intermingling of these two varieties of beans and is not yet strong enough to maintain its present outlines. Our people in my section of the State call this the Landers or Sanborn bean. On the other hand the Files bean has only a tendency toward the white or pea bean, and the latter may be practically eliminated by seed selection. I believe this variety is much to be preferred for its rich eating qualities to the first kind mentioned. Yet, I am prone to

believe this is not a very close type of the strictly old fashioned yellow-eyes, having too much yellow upon them and being considerably larger. This same bean I have raised for several years and it has been of good quality and quite free from rust.

The sample of the Morse bean which I believe to be nearest the type that we desire and to have the strongest tendencies to maintain its own characteristics did not prove all that I hoped it would. They rusted quite a little and did not appear very vigorous at any time during this season, although the plants had the best of care. Yet I for one am willing to adopt the Morse bean as a standard for our Association. It may not be improper to merely suggest that we might reduce our different types by one and continue our further investigations with the Morse and Austin varieties.

It should be our purpose to breed a type that is as hardy as possible against rust and other fungous diseases; also one that is productive. If this can be done the bean crop will be a profitable one for the average Maine farmer to raise. The rust appears to do its deadly work more destructively some years than others, due perhaps to the climatic conditions at the time when the plant is most susceptible to such agencies. The treatment of seed, the removal of diseased seedlings, and spraying with Bordeaux mixture have accomplished practically nothing toward the procuring of a clean crop of beans. But it seems to me one of the surest and best methods to bring this about is through pod or stalk selection. I know of no reason why if one bean in a pod is affected the rest are not, although they may show no outward signs of infection. If a pod is affected without and the beans perfectly clean within, I fail to see why these beans are not infected and do not carry this disease with them.

BOYS' JUDGING CONTEST.

At 11.00 o'clock the boys' judging contest in potatoes and corn was held, and the following awards were made:

Judging Contest in Corn—Earl Smith, Dixmont, 1st; Harry Getchell, North Anson, 2nd.

Judging Contest in Potatoes—Earl Smith, Dixmont, 1st; Harry Getchell, North Anson, 2nd.

AFTERNOON SESSION.

In the absence of the President the afternoon session was called to order by A. P. Howes, Vice-President. A most interestin paper was presented by Dr. Raymond Pearl on

---

SOME FACTORS IN POTATO IMPROVEMENT.

The following points were discussed:—

1. In every plant and animal there are limitations set to the possible improvement of that plant or animal by (a) the method or mechanism of inheritance peculiar to it, (b) the frequency and regularity of occurrence of desirable and inheritable variations, and (c) the method of reproduction.

2. In the potato the most important of these limitations is found in the method of reproduction. The potato is propagated vegetatively: that is, by setting out annually what amounts to cuttings from the plant grown the year before. A potato tuber is not a seed in the botanical sense; it is a part of the stem of the potato plant, and the eye is a bud.

3. This being so, tuber selection, however long continued, is not likely to originate new and desirable varieties. The only possibility of this happening would be through the occurrence of inheritable bud variations of a desirable sort. Such inheritable bud variations apparently do not occur with great frequency in the potato.

4. Tuber selection, however, may be a very desirable thing to practice, for the purpose of purifying the stock which one is using for seed. Most varieties of potatoes undoubtedly represent mixtures of varying numbers of true strains of biotypes. Tuber selection may be very valuble in isolating and preserving desirable strains or biotypes from the mixture, and discarding undesirable biotypes.

5. One should not expect continued improvement to follow tuber selection. In the nature of the case this is not to be expected, and if one fails to get it he should not indiscriminately condemn the whole practice of tuber selection.

6. The histories of the existing commercial varieties of potatoes, so far as these histories are known, indicate that

these varieties have in nearly every instance originated from seedlings. They represent, in other words, true hereditary strains or biotypes. While seedling selection is not to be recommended to the practical potato grower as a method of improving his crop, nevertheless it will furnish a source of interest and possibly large profit to plant a small amount of potato seed (from the seed balls) and study the seedlings which result. If a highly desirable seedling plant appears it may be propagated indefinitely by the tubers in the ordinary way.

The Association voted to pay the traveling and hotel expenses of the Executive Committee when in attendance at meetings of said Committee. The educational program and business of the Association having been completed, it was voted to adjourn.

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	F. O. Beal	Bangor	S. P. Emery	Bangor	A. S. Field	Bangor.
Central Maine Fair Co	Martin F. Bartlett	Waterville	J. C. Fuller	Waterville	Lewis G. Whipple	Waterville.
Maine State Pomological	G. M. Twitchell	Auburn	E. L. White	Bowdoinham	E. L. Lincoln	Wayne.
Maine State Poultry Association	H. L. Hunton	Oakland	A. L. Merrill	Auburn	W. E. Scott	Portland.
Androscoggin County Agricultural and Horticultural	Fred A. Pike	East Livermore	W. N. Gilbert	Livermore Falls	Samuel Smith	Livermore Falls.
Aroostook, Northern Maine Fair Ass'n	A. E. Irving	Presque Isle	Ernest T. McGlauflin	Presque Isle	John E. Bishop	Presque Isle.
Cumberland County Agricultural and Horticultural	Chas. W. Chaplin	Sebago Lake	C. H. Leighton	Cumberland Mills	Harry C. Palmer	Gorham.
Cumberland Farmers' Club	A. W. Stanley	Cumberland Jct	Ernest W. Winslow	Woodfords, Box 38, R. D. 2.	Willard Wilson	Cumberland Ctr.
Cumberland, New Gloucester and Danville	Manley F. Burnham	Auburn	J. P. Witham	New Gloucester	George W. Haskell.	New Gloucester.
Cumberland, Freeport Agricultural Society	J. A. Brewster	Freeport	Geo. P. Coffin	Freeport	Elmer L. Porter	Freeport.
Cumberland, Freeport Poultry Ass'n	A. Q. Carter	Freeport	Geo. P. Coffin	Freeport	A. P. Winslow	Freeport.
Franklin County	Howard N. Gould	Farmington	Chas. F. Smith	Farmington	George M. Currier	Farmington.
Franklin, North	Elbridge Dill	Phillips	O. M. Moore	Farmington, R. D.	A. W. Davenport	Farmington.
Hancock County	F. P. Merrill	Bluehill	C. S. Snowman	Bluehill	M. R. Hinckley	Bluehill.
Hancock, North	Frank E. Mace	State House, Augusta.	Harold M.Kenniston	Amherst	J. G. Dunham	Amherst.
Hancock, Eden	A. S. Bunker	West Eden	F. A. Wood	Salisbury Cove	C. F. King	Eden.
Hancock, North Ellsworth Farmers' Club	James A. Salisbury.	Nicolin	H. F. Maddocks	Ellsworth, R. 3	Alvin E. Maddocks.	Nicolin.
Kennebec County	E. E. Peacock	Readfield	L. O. Tebbetts	Augusta	Fred A. Walker	Readfield.
Kennebec, South	Leslie B. Hisler	Windsorville	Edwin Bullock	Windsorville	J. S. Gray	Windsorville.
Knox, North	E. E. Thurston	Union	H. L. Grinnell	Union	Geo. C. Hawes	Union.
Lincoln County	Leslie Boynton	Jefferson	A. L. Shaw	Damariscotta	H. E. Winslow	Damariscotta.
Lincoln, Bristol	Artell Russell	Bristol	J. Wilbur Hunter	Damarisotta	C. B. Woodward	Damariscotta.
Oxford County	W. J. Wheeler	So. Paris	W. O. Frothingham.	So. Paris	W. O. Frothingham.	So. Paris.
Oxford, West	Wm. Gordon	Fryeburg	B. Walker McKeen	Fryeburg	Alvin D. Merrill	Fryeburg.
Oxford, Androscoggin Valley	Wallace W. Rose	Canton	O. M. Richardson	Canton	W. S. Marble	Dixfield.
Oxford, North	Charles T. Poor	Andover	John F. Talbot	Andover	R. A. Grover	Andover.
Oxford, Western Maine Poultry Ass'n	E. A. Shurtleff	So. Paris	E. P. Crockett	So. Paris	D. H. Bean	So. Paris.
Penobscot, West	E. M. Atkins	Dexter, Route 3	E. E. Colbath	Dexter, Route 3	F. C. Barker	Exeter.

Penobscot, North	S. T. Mallett	Springfield	I. R. Averill	Prentiss	C. M. Lombard	Springfield.
Penobscot, Orrington	Chas. H. Chapman.	So. Brewer, R. D. 1	F. Elmer King	So.Brewer,R.F.D1	F. Elmer King	So.Brewer,R.F.D1
Penobscot, Bangor Poultry and Pet Stock Association	Frank H. Tupper	Bangor	F. G. Bishop	Route 8, Bangor.	F. G. Bishop	Route 8, Bangor.
Piscataquis County	C. W. Hayes	Foxcroft	E. C. McKechnie	Foxcroft	A. J. McNaughton	Foxcroft.
Sagadahoc County	E. C. Patten	Topsham	John R. Stanwood	Brunswick	Lyman E. Smith	Brunswick.
Sagadahoc, Richmond Farmers' and Mechanics' Club	George M. Curtis	Richmond	N. H. Skelton	Richmond	Wm.R. Fairclough	Richmond.
Somerset County	B. Frank Burns	Madison	Orlando Walker	Anson	E. H. Athearn	Anson.
Somerset, East	A. W. Miller	Hartland	E. A. Webber	Hartland	A. K. Libby	Hartland.
Somerset, Central	Clyde H. Smith	Skowhegan	Chas. H. Gardner	Skowhegan	John W. Fogler	Skowhegan.
Somerset, Embden	G. G. Palmer	No. Anson, R.F.D.	Guy F. Williams	No.Anson,R.F.D.1	Geo. O. Moulton	No.Anson,R.F.D.1
Waldo County	John B. Darling	Belfast	Orrin J. Dickey	Belfast	Orrin J. Dickey	Belfast.
Waldo and Penobscot	Fred'k. M. Nickerson	Monroe	F. H. Putnam	Monroe	Franklin Chase	Monroe.
Waldo, Unity Park Association	Wm. H. Kimball	Burnham	E. T. Reynolds	Unity	E. T. Reynolds	Unity.
Washington County	Dr. T. W. Pomeroy	Pembroke	J. M. Morgan	West Pembroke	A. E. Lincoln	Dennysville.
Washington, West	A. H. Chandler	Columbia Falls	Wm. N. Dyer	Harrington	E. V. Coffin	Harrington.
Washington, Machias Fair Association	E. I. White	Machias	W. H. Phinney	Machias	W. H. Phinney	Machias.
Washington, Calais Fair Association	Wilfred L. Eaton	Calais	Thomas J. Doyle	Calais	Elbridge C. Short	Calais.
York, Shapleigh and Acton	Elmer E. Nason	Acton	Fred K. Bodwell	Acton	George T. Crediford.	Shapleigh.
York, Cornish Agricultural Association	O. W. Adams	Cornish	Wm. R. Copp	Cornish	Sam'l G. Sawyer	Cornish.

ANALYSIS OF EXHIBITION.

Name of Society.	Number of horses and colts.	Number of thoroughbred bulls and bull calves.	Number of thoroughbred cows, heifers and heifer calves.	Number of grade 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	130	70	265	60	290	30	85	715	280	60	485
Eastern Maine Fair Association	97	45	98	34	14	—	100	191	7	20	500
Central Maine Fair Co	105	101	265	51	120	120	220	537	178	52	1,650
Maine State Pomological	—	—	—	—	—	—	—	—	—	—	—
Maine State Poultry Association	—	—	—	—	—	—	—	—	—	—	2,500
Androscoggin County	90	25	50	60	75	20	28	225	25	10	75
Aroostook, Northern Maine Fair Association	160	57	155	34	8	—	70	254	45	13	624
Cumberland County	81	40	65	24	187	10	45	371	28	56	172
Cumberland Farmers' Club	28	4	16	6	50	6	8	90	11	5	180
Cumberland, New Gloucester and Danville	32	5	15	27	4	—	8	59	—	10	51
Cumberland, Freeport Agricultural Society	10	3	14	5	4	—	8	26	6	12	210
Cumberland, Freeport Poultry Association	—	—	—	—	—	—	—	—	—	—	600
Franklin County	94	51	161	122	444	30	115	923	233	22	78
Franklin, North	61	11	27	55	164	8	34	257	124	26	16
Hancock County	25	6	—	30	38	36	—	110	25	20	15
Hancock, North	24	1	9	11	7	—	—	28	11	2	33
Hancock, Eden	4	2	4	1	—	—	—	7	8	2	40
Hancock, No. Ellsworth Farmers' Club	—	1	3	—	—	—	—	4	—	9	6
Kennebec County	71	12	19	30	32	16	23	132	14	17	42
Kennebec, South	14	1	1	12	86	10	—	110	1	2	12
Knox, North	30	4	12	15	62	15	14	122	12	7	22
Lincoln County	38	1	4	5	50	14	6	80	5	12	27
Lincoln, Bristol	21	1	—	14	30	—	—	45	9	—	20
Oxford County	119	32	74	87	178	14	36	421	100	20	174

Oxford, West	112	23	61	82	218	35	86	386	63	20	72
Oxford, Androscoggin Valley	60	10	33	41	38	4	16	142	18	–	30
Oxford, North	14	7	31	26	24	2	18	104	38	34	11
Oxford, Western Maine Poultry Association	–	–	–	–	–	–	–	–	–	–	470
Penobscot, West	67	18	59	49	30	–	32	188	53	9	99
Penobscot, North	12	–	–	–	2	–	–	2	6	–	–
Penobscot, Orrington	12	–	–	7	2	–	4	13	–	2	–
Penobscot, Bangor Poultry and Pet Stock Ass'n	–	–	–	–	–	–	–	–	–	–	–
Piscataquis County	40	10	29	40	12	–	66	157	27	10	14
Sagadahoc County	46	55	168	110	72	6	269	680	33	22	87
Sagadahoc, Richmond Farmers' and Mechanics' Club	27	5	13	11	8	2	6	45	–	–	21
Somerset County	20	6	16	35	68	20	5	150	120	–	41
Somerset, East	39	8	17	41	6	–	29	72	7	3	18
Somerset, Central	32	6	21	36	58	10	–	131	90	47	–
Somerset, Embden	17	3	11	4	2	–	2	17	1	–	–
Waldo County	50	22	48	24	76	22	78	172	47	32	119
Waldo and Penobscot	47	26	60	30	88	18	23	245	46	11	31
Waldo, Unity Park Association	101	12	48	43	8	4	34	109	33	11	157
Washington County	31	5	16	35	19	–	19	75	39	20	25
Washington, West	24	13	16	32	20	–	–	81	39	5	38
Washington, Machias Fair Association	17	4	8	13	14	–	–	39	8	7	50
Washington, Calais Fair Association	20	7	32	11	4	–	10	64	–	42	75
York, Shapleigh and Acton	2	1	–	4	70	12	–	87	4	2	20
York, Cornish Agricultural Association	34	15	44	45	120	12	5	241	19	18	58
	2,058	729	1,988	1,402	2,802	476	1,502	7,907	1,813	672	8,968

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	$53 00	$30 00	$110 00	$18 00	—	$50 00	$35 00	$110 00	$78 00
Eastern Maine Fair Association	58 00	15 00	41 00	20 00	$17 00	18 00	10 00	—	58 00
Central Maine Fair Co	59 00	15 00	20 00	14 00	—	25 50	12 00	80 00	41 00
Maine State Pomological	—	—	—	—	—	—	—	—	—
Maine State Poultry Association	—	—	—	—	—	—	—	—	—
Androscoggin County	25 00	20 00	10 00	25 00	25 00	12 00	—	65 00	25 00
Aroostook, Northern Maine Fair Association	67 00	25 00	109 00	119 00	27 00	7 00	—	291 00	90 00
Cumberland County	40 00	30 00	27 00	30 00	20 00	—	10 00	32 00	47 00
Cumberland Farmers' Club	3 00	2 00	2 00	2 00	—	—	—	8 00	8 00
Cumberland, New Gloucester and Danville	4 00	6 00	4 00	—	2 00	5 00	—	16 00	21 00
Cumberland, Freeport Agricultural Society	—	—	—	—	—	8 00	—	—	5 00
Cumberland, Freeport Poultry Association	—	—	—	—	—	—	—	—	—
Franklin County	17 50	12 00	20 00	12 00	47 00	20 00	21 00	35 00	20 00
Franklin, North	5 50	4 00	2 00	4 50	—	6 00	7 00	20 75	19 00
Hancock County	10 00	4 00	4 00	6 00	—	3 00	2 00	20 00	—
Hancock, North	—	—	—	2 25	1 50	2 25	—	4 75	19 25
Hancock, Eden	—	—	—	—	—	—	—	11 00	—
Hancock, No. Ellsworth Farmers' Club	—	—	—	—	—	—	—	—	—
Kennebec County	28 00	12 50	8 00	12 50	9 00	6 00	6 00	24 00	10 00
Kennebec, South	3 75	—	2 50	—	—	4 00	—	3 00	18 00
Knox, North	2 00	—	2 00	—	3 00	2 50	2 50	24 50	12 00
Lincoln County	6 00	5 00	3 00	—	2 00	10 00	—	7 75	5 00
Lincoln, Bristol	—	—	—	3 00	—	—	—	—	—
Oxford County	49 00	27 00	—	—	24 00	31 00	—	75 00	151 00

Oxford, West	28 00	23 00	7 50	14 00	–	–	15 00	26 50	68 00
Oxford, Androscoggin Valley	21 00	10 00	8 00	6 00	3 00	10 00	8 00	29 00	81 00
Oxford, North	–	3 75	5 00	4 00	–	–	–	–	64 00
Oxford, Western Maine Poultry Association	–	–	–	–	–	–	–	–	–
Penobscot, West	7 00	13 00	7 00	6 00	–	6 00	5 00	39 50	107 00
Penobscot, North	–	–	2 00	1 50	–	–	–	4 50	3 00
Penobscot, Orrington Agricultural Association	–	–	–	4 00	–	4 50	–	4 00	–
Penobscot, Bangor Poultry and Pet Stock Ass'n	–	–	–	–	–	–	–	–	–
Piscataquis County	–	3 00	5 00	6 00	–	–	5 00	10 50	80 00
Sagadahoc County	21 00	5 00	13 00	15 00	8 00	15 00	–	52 00	40 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	2 00	1 00	1 00	4 25	–	–	–	6 45	4 00
Somerset County	5 00	2 00	–	–	5 00	5 00	–	4 00	10 00
Somerset, East	12 00	7 50	9 50	6 00	–	5 25	–	12 75	102 00
Somerset, Central	8 00	5 00	3 00	3 00	–	50 00	10 00	13 25	42 00
Somerset, Embden	–	–	5 00	–	–	–	–	6 00	20 00
Waldo County	5 00	4 00	16 00	6 00	–	5 00	8 00	8 00	15 00
Waldo and Penobscot	22 00	11 00	31 00	21 00	12 00	12 00	12 00	35 00	100 00
Waldo, Unity Park Association	12 50	5 00	10 00	6 00	10 00	16 00	8 00	19 75	25 00
Washington County	3 00	4 00	5 00	9 00	–	–	–	20 50	14 00
Washington, West	–	–	–	–	–	192 00	–	13 00	36 00
Washington, Machias Fair Association	13 00	6 00	–	11 00	–	–	–	12 00	2 00
Washington, Calais Fair Association	16 00	5 00	10 00	5 00	–	–	–	18 00	–
York, Shapleigh and Acton	–	–	–	–	3 00	–	–	–	–
York, Cornish Agricultural Association	13 00	6 00	–	–	7 00	7 00	4 00	28 00	50 00
	$619 25	$321 75	$502 50	$396 00	$225 50	$538 00	$180 50	$1,190 45	$1,490 25

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	$330 00	$760 00	$230 00	$220 00	$ 64 00	$66 00	$20 00	$195 00	$150 00	$276 00
Eastern Maine Fair Association	263 00	312 00	96 00	20 00	–	–	–	–	–	–
Central Maine Fair Co	330 50	445 50	81 50	310 00	110 00	50 00	5 00	197 00	99 00	188 90
Maine State Pomological	–	–	–	–	–	–	–	–	–	–
Maine State Poultry Association	–	–	–	–	–	–	–	–	–	–
Androscoggin County	30 00	50 00	40 00	15 00	40 00	45 00	10 00	25 00	75 00	75 00
Aroostook, Northern Maine Fair Association	377 00	710 00	58 00	96 00	24 00	–	8 00	–	–	–
Cumberland County	100 00	110 00	43 00	45 00	35 00	30 00	13 00	22 00	16 00	98 00
Cumberland Farmers' Club	6 00	18 00	8 00	9 00	9 00	13 00	5 00	9 00	27 00	58 00
Cumberland, New Gloucester and Danville	10 00	16 50	26 75	6 00	–	2 00	2 00	–	–	–
Cumberland, Freeport Agricultural Society	–	5 75	4 00	16 00	5 00	–	–	–	–	–
Cumberland, Freeport Poultry Association	–	–	–	–	–	–	–	–	–	–
Franklin County	112 00	265 00	107 50	110 00	96 50	54 00	3 00	23 50	136 00	80 00
Franklin, North	8 90	22 85	18 10	15 00	12 00	10 65	2 75	6 50	27 67	28 00
Hancock County	20 00	–	45 50	–	25 00	–	–	10 00	–	26 00
Hancock, North	1 00	4 75	4 00	–	2 75	–	–	–	–	–
Hancock, Eden	6 00	4 00	1 50	–	–	–	–	–	–	–
Hancock, No. Ellsworth Farmers' Club	5 00	10 00	–	–	–	–	–	–	–	–
Kennebec County	10 00	49 00	34 50	18 00	24 00	10 00	–	9 00	–	12 00
Kennebec, South	4 50	3 50	14 50	–	20 75	13 00	6 00	14 00	32 00	74 00
Knox, North	12 00	17 00	19 75	12 00	26 25	12 50	–	5 00	45 00	51 50
Lincoln County	3 00	8 00	4 50	–	6 00	18 25	3 00	7 50	35 00	49 00
Lincoln, Bristol	–	–	6 25	–	9 25	–	–	–	–	5 00

Oxford County	145 00	173 00	181 00	60 00	146 00	73 00	–	26 00	76 00	228 00
Oxford, West	94 00	126 50	128 50	72 00	45 50	35 50	8 00	32 00	160 00	78 50
Oxford, Androscoggin Valley	22 00	38 00	63 00	15 00	24 00	28 00	5 00	7 00	34 00	40 00
Oxford, North	12 00	70 00	30 00	15 00	18 00	6 00	10 00	3 00	–	16 00
Oxford, Western Maine Poultry Association	–	–	–	–	–	–	–	–	–	–
Penobscot, West	36 00	135 00	69 25	54 00	26 00	26 00	–	–	–	–
Penobscot, North	–	–	–	–	–	–	1 50	–	2 00	–
Penobscot, Orrington	3 00	–	5 00	4 00	–	–	–	–	–	–
Penobscot, Bangor Poultry and Pet Stock Ass'n	–	–	–	–	–	–	–	–	–	–
Piscataquis County	18 50	36 50	25 25	37 00	15 00	–	–	–	–	–
Sagadahoc County	332 00	584 00	137 25	155 00	66 00	56 00	12 00	12 00	52 00	205 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	2 30	7 25	3 80	1 00	1 60	60	–	60	–	–
Somerset County	5 75	13 25	18 25	3 00	13 75	13 00	–	12 00	28 00	42 00
Somerset, East	32 00	21 00	39 50	9 00	8 00	–	–	–	–	–
Somerset, Central	14 00	30 50	49 00	50 00	18 50	14 00	–	17 00	26 66	74 58
Somerset, Embden	3 00	–	–	6 00	2 00	–	–	–	–	–
Waldo County	51 00	51 00	10 00	38 00	13 00	8 00	10 00	9 00	30 00	30 00
Waldo and Penobscot	69 00	243 00	92 00	101 00	55 00	31 00	12 00	38 00	–	123 00
Waldo, Unity Park Association	28 50	59 50	41 25	48 00	5 00	5 50	–	5 50	–	10 00
Washington County	12 50	15 50	24 00	22 00	16 00	–	–	–	–	–
Washington, West	64 00	72 00	72 00	–	80 00	–	–	–	–	36 00
Washington, Machias Fair Association	16 00	26 00	12 50	–	23 00	–	–	–	–	–
Washington, Calais Fair Association	32 00	61 00	4 00	20 00	16 00	–	–	–	–	–
York, Shapleigh and Acton	1 00	–	5 00	–	6 00	29 50	–	6 00	45 00	9 00
York, Cornish Agricultural Association	59 00	156 00	92 00	8 00	140 00	66 00	4 00	18 00	68 00	93 00
	$2,681 45	$4,730 85	$1,945 90	$1610 00	$1,247 85	$716 50	$140 25	$709 60	$1,164 33	$2,006 48

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 manufactures and needle-work.	Amount of premiums awarded objects not named above.	Total amount of premiums and gratuities awarded.
Maine State Agricultural	$713 00	$126 00	$270 00	$120 00	$216 00	$504 00	$31 00	–	$193 20	$250 00	$5,218 20
Eastern Maine Fair Association	–	25 00	176 25	125 80	266 00	73 00	54 00	–	208 05	216 82	2,072 92
Central Maine Fair Company	569 00	126 00	805 25	92 00	204 75	226 80	46 75	–	264 82	743 00	5,162 27
Maine State Pomological	–	–	–	–	382 00	–	–	–	–	–	382 00
Maine State Poultry Association	–	–	2,600 00	–	–	–	–	–	–	–	2,600 00
Androscoggin County	25 00	–	50 00	75 00	75 50	40 50	25 00	10 00	85 00	60 00	1,058 00
Aroostook, Northern Maine Fair Association	249 00	39 00	470 10	163 90	153 85	62 25	28 00	–	257 70	413 60	3,845 40
Cumberland County	21 00	12 00	235 50	22 50	20 25	30 00	–	–	33 00	66 00	1,188 25
Cumberland Farmers' Club	16 00	1 50	78 00	39 75	24 00	13 25	50	–	47 55	–	407 55
Cumberland, New Gloucester and Danville	–	10 00	18 00	19 50	15 50	14 00	11 00	–	27 60	6 50	243 35
Cumberland, Freeport Agricultural Society	2 50	6 00	59 75	36 20	18 95	7 35	–	–	9 75	1 75	186 00
Cumberland, Freeport Poultry Ass'n	–	–	369 98	–	–	–	–	–	–	–	369 98
Franklin County	135 75	12 50	36 60	98 35	61 10	30 10	–	–	28 25	–	1,594 65
Franklin, North	31 50	4 75	6 75	12 75	10 30	3 85	1 05	–	23 10	50	315 72
Hancock County	16 00	10 00	15 50	79 50	27 25	10 25	14 25	–	50 25	6 50	405 00
Hancock, North	3 80	1 10	3 00	17 80	17 70	75	–	–	14 05	50	101 20
Hancock, Eden	4 00	4 00	38 50	64 90	21 20	14 00	19 00	–	14 80	–	202 90
Hancock, No Ellsworth Farmers' Club	–	–	5 00	26 50	24 75	3 50	2 50	–	4 50	1 00	82 75
Kennebec County	5 50	6 00	43 50	81 00	194 00	28 00	9 75	–	74 00	3 00	727 25
Kennebec, South	4 00	4 00	11 00	15 20	22 80	–	1 00	–	48 05	40 00	359 55

Knox, North	5 00	16 00	14 00	25 75	53 40	9 00	9 65	–	26 80	49 22	461 32
Lincoln County	1 00	4 00	15 50	12 25	28 55	7 50	1 25	–	29 45	53 50	326 00
Lincoln, Bristol	5 00	–	12 00	18 30	8 90	3 75	–	–	24 70	31 95	125 10
Oxford County	80 00	56 00	144 50	81 50	409 25	27 75	9 25	29 00	121 30	367 00	2,790 55
Oxford, West	35 00	15 40	25 20	20 60	15 30	13 60	12 60	–	20 80	180 00	1,301 00
Oxford, Androscoggin Valley	13 00	–	22 00	29 40	45 50	9 00	3 00	4 00	56 20	55 85	689 95
Oxford, North	24 00	15 00	8 00	16 00	8 00	8 00	6 00	–	10 00	22 00	373 75
Oxford, Western Maine Poultry Association	–	–	427 00	–	–	–	–	–	–	–	427 00
Penobscot, West	39 00	24 00	96 80	52 10	55 55	12 95	16 45	–	116 20	30 00	979 80
Penobscot, North	2 00	–	–	19 65	145 20	9 75	–	–	50 00	62 00	303 10
Penobscot, Orrington	–	4 00	–	11 00	19 85	1 50	1 50	–	39 00	10 75	112 10
Penobscot, Bangor Poultry and Pet Stock Association	–	–	323 75	–	–	–	–	–	–	–	323 75
Piscataquis County	9 00	4 00	18 75	10 75	16 75	8 50	–	–	18 00	29 50	357 00
Sagadahoc County	30 00	81 00	180 45	208 00	135 00	77 25	38 25	–	124 50	172 25	2,826 95
Sagadahoc, Richmond Farmers' and Mechanics' Club	–	–	4 20	11 90	11 25	2 35	1 60	–	8 15	1 40	76 70
Somerset County	37 25	–	22 00	4 45	4 75	2 85	–	–	43 55	–	294 85
Somerset, East	6 25	5 75	12 00	11 00	10 00	3 25	1 00	–	11 50	45 00	370 25
Somerset, Central	104 00	15 00	247 50	39 00	50 75	25 50	–	–	23 50	–	933 74
Somerset, Embden	–	–	–	9 00	–	–	–	–	–	–	51 00
Waldo County	33 00	23 00	103 10	49 50	32 75	5 00	–	–	88 05	3 50	654 90
Waldo and Penobscot	61 00	67 00	31 50	48 75	123 25	16 00	1 50	–	107 90	5 00	1,481 90
Waldo, Unity Park Association	15 00	3 50	81 75	32 50	11 25	10 00	18 00	6 00	46 75	53 00	593 25
Washington County	21 00	5 00	19 00	64 75	21 25	17 50	13 25	–	44 30	2 50	354 05
Washington, West	66 00	24 00	26 00	199 00	66 50	49 00	–	–	303 60	–	1,299 10
Washington, Machias Fair Ass'n	9 00	3 00	68 65	83 61	48 60	21 00	75	–	95 24	–	451 35
Washington, Calais Fair Ass'n	–	24 00	100 75	81 50	44 75	13 65	1 50	–	120 50	5 00	578 65
York, Shapleigh and Acton	3 75	2 50	12 50	75 25	45 00	15 50	10 00	–	42 00	92 00	403 00
York, Cornish Agricultural Ass'n	15 00	22 00	76 00	11 00	33 50	5 50	15 50	–	40 85	–	1,038 35
	$2,410 30	$802 00	$7,385 58	$2,317 16	$3,200 75	$1,437 25	$404 85	$49 00	$2,996 51	$3,080 59	$46,501 40

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	$2,459 00	–	–	$2,488 50	$21,930 06	$26,877 56
Central Maine Fair Company	2,500 00	5,420 00	2,000 00	2,421 50	16,719 06	29,060 56
Maine State Pomological	1,000 00	123 00	–	–	614 66	1,737 66
Maine State Poultry Association	1,168 44	82 00	–	–	1,625 00	2,875 44
Androscoggin County	608 42	45 00	500 00	350 00	1,250 00	2,753 42
Aroostook, Northern Maine Fair Association	1,729 34	33 00	–	875 00	8,920 48	11,557 82
Cumberland County	637 68	–	–	377 50	4,829 18	5,844 36
Cumberland Farmers' Club	223 58	81 25	400 00	190 00	1,831 29	2,726 12
Cumberland, New Gloucester and Danville	115 48	65 00	–	180 00	889 38	1,249 86
Cumberland, Freeport Agricultural Society	110 93	1 00	–	207 50	316 11	635 54
Cumberland, Freeport Poultry Association	227 98	46 00	–	–	437 08	711 06
Franklin County	734 22	736 00	–	610 00	2,609 86	4,690 08
Franklin, North	126 87	291 00	400 00	22 50	501 09	1,341 46
Hancock County	194 33	–	–	121 41	1,876 22	2,191 96
Hancock, North	48 11	–	–	–	523 33	571 44
Hancock, Eden	93 35	28 00	–	98 50	988 58	1,208 43
Hancock, North Ellsworth Farmers' Club	76 11	3 00	–	–	97 50	176 61
Kennebec County	300 53	10 00	–	–	973 89	1,284 42
Kennebec, South	150 78	26 00	700 00	33 75	634 74	1,545 27
Knox, North	178 06	2 00	–	15 00	2,119 05	2,314 11
Lincoln County	127 42	90 00	–	96 25	860 96	1,174 63
Lincoln, Bristol	43 91	2 50	–	–	254 34	300 75

Oxford County	1,281 35	43 00	–	672 50	5,992 76	7,989 61
Oxford, West	566 13	25 00	–	135 50	3,125 75	3,852 38
Oxford, Androscoggin Valley	339 56	3 00	300 00	300 00	1,567 84	2,510 40
Oxford, North	193 95	10 00	–	–	559 58	763 53
Oxford, Western Maine Poultry Association	97 64	32 00	–	–	566 10	695 74
Penobscot, West	405 90	79 00	–	348 25	1,785 85	2,619 00
Penobscot, North	127 39	5 00	550 00	200 55	1,377 29	2,260 23
Penobscot, Orrington	–	–	–	61 25	734 35	795 60
Penobscot, Bangor Poultry and Pet Stock Association	76 95	50 00	–	–	295 85	422 80
Sagadahoc County	2,368 70	480 00	1,050 00	755 00	7,717 65	12,371 35
Sagadahoc, Richmond Farmers' and Mechanics' Club	35 87	1 00	14 00	–	100 00	150 87
Somerset County	159 22	46 00	200 00	–	374 59	779 81
Somerset, East	210 88	72 00	36 00	–	806 66	1,125 54
Somerset, Central	311 18	30 00	700 00	380 00	3,296 25	4,717 43
Somerset, Embden	15 23	–	–	–	40 25	55 48
Waldo County	281 33	40 00	600 00	650 00	2,299 64	3,870 97
Waldo and Penobscot	575 75	–	–	505 00	1,189 51	2,270 26
Waldo, Unity Park Association	259 52	–	–	114 00	875 00	1,248 52
Washington County	136 12	11 00	–	114 00	1,174 40	1,435 52
Washington, West	636 61	1 00	1,500 00	350 00	3,095 85	5,583 46
Washington, Machias Fair Association	214 33	4 00	–	430 00	1,830 42	2,478 75
Washington, Calais Fair Association	–	3,805 00	–	312 50	4,226 57	8,344 07
York, Shapleigh and Acton	201 22	193 00	60 00	–	31 58	485 80
York, Cornish Agricultural Association	472 16	–	490 00	590 00	2,655 41	4,207 57
Total	$21,821 53	$12,014 75	$9,500 00	$14,005 96	$116,521 01	$173,863 25

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	$1,425 00	$4,500 00	$6,907 44	$5,288 53	$23,339 17	$61,500 00	$15,200 00
Central Maine Fair Company	1,076 44	4,427 50	10,256 55	5,609 60	26,532 36	-	3,005 23
Maine State Pomological	-	-	-	-	1,737 66	-	-
Maine State Poultry Association	-	-	725 00	500 00	3,825 00	1,750 00	-
Androscoggin County	200 00	1,300 00	150 00	200 00	2,908 00	2,000 00	1,000 00
Aroostook, Northern Maine Fair Association	2,575 94	2,000 00	2,936 53	180 00	11,537 87	30,000 00	3,700 00
Cumberland County	313 44	1,052 50	1,249 95	296 33	4,100 47	7,000 00	1,500 00
Cumberland Farmers' Club	96 73	550 00	633 62	679 50	2,367 40	3,000 00	400 00
Cumberland, New Gloucester and Danville	143 47	520 00	155 93	145 48	1,208 23	2,000 00	85 00
Cumberland, Freeport Agricultural Society	-	525 00	174 23	-	885 23	2,000 00	1,475 00
Cumberland, Freeport Poultry Association	-	-	203 69	75 00	648 67	300 00	-
Franklin County	-	990 00	650 00	-	3,234 65	14,000 00	569 75
Franklin, North	22 06	246 25	133 91	622 54	1,340 48	2,500 00	2,479 00
Hancock County	100 00	686 25	939 41	-	2,130 66	6,000 00	-
Hancock, North	25 00	-	540 52	-	666 72	150 00	69 78
Hancock, Eden	142 00	150 55	160 00	50 64	706 09	2,400 50	1,520 00
Hancock, North Ellsworth Farmers' Club	-	-	84 00	-	166 75	2,000 00	300 00
Kennebec County	75 00	500 00	68 00	162 87	1,533 12	3,500 00	2,000 00
Kennebec, South	-	175 00	222 05	125 41	882 01	800 00	663 02
Knox, North	-	700 00	600 00	515 18	2,276 50	1,400 00	150 00
Lincoln County	-	492 00	450 00	112 92	1,380 92	2,000 00	350 00
Lincoln, Bristol	33 01	-	82 67	10 00	250 78	1,000 00	-

Oxford County	914 30	1,690 00	1,600 71	820 29	7,815 85	12,000 00	–
Oxford, West	526 25	960 00	850 00	225 00	3,862 25	12,500 00	1,200 00
Oxford, Androscoggin Valley	203 00	800 00	247 60	549 30	2,489 85	4,200 00	1,805 00
Oxford, North	25 00	–	75 00	235 63	709 38	2,000 00	250 00
Oxford, Western Maine Poultry Association	10 25	–	89 42	86 12	612 79	–	60 00
Penobscot, West	269 30	775 00	289 40	364 09	2,677 59	5,650 00	4,950 00
Penobscot, North	1,300 00	575 00	334 00	150 00	2,662 10	2,800 00	–
Penobscot, Orrington	1,608 56	275 75	195 75	54 00	2,246 16	2,000 00	–
Penobscot, Bangor Poultry and Pet Stock Association	–	–	39 00	–	362 75	–	100 00
Piscataquis County	–	–	–	–	–	–	–
Sagadahoc County	2,500 00	1,900 00	2,500 00	1,800 25	11,527 20	5,000 00	–
Sagadahoc, Richmond Farmers' and Mechanics' Club	–	–	66 85	–	143 55	–	–
Somerset County	33 50	160 00	197 50	121 00	806 85	500 00	225 00
Somerset, East	–	360 00	50 00	556 36	1,336 61	2,500 00	1,360 00
Somerset, Central	250 00	923 00	975 00	1,424 14	4,505 88	4,000 00	3,930 57
Somerset, Embden	6 00	–	4 00	–	61 00	4 00	4 57
Waldo County	800 00	1,009 99	1,680 31	2,000 00	6,145 20	5,000 00	1,850 00
Waldo and Penobscot	400 00	1,427 00	–	396 14	3,705 04	5,000 00	1,100 00
Waldo, Unity Park Association	150 00	575 00	225 00	–	1,543 25	–	294 73
Washington County	69 66	385 30	92 00	533 87	1,434 88	–	139 36
Washington, West	261 40	880 00	1,496 53	1,045 04	4,982 07	1,936 00	2,200 00
Washington, Machias Fair Association	–	1,160 00	1,456 30	–	3,067 65	–	588 60
Washington, Calais Fair Association	7,024 14	1,110 00	2,355 37	432 51	11,500 67	7,000 00	3,156 90
York, Shapleigh and Acton	–	–	44 00	17 80	464 80	2,000 00	–
York, Cornish Agricultural Association	671 30	1,200 00	705 86	579 75	4,195 26	4,500 00	–
Total	$23,250 75	$34,981 09	$42,893 10	$25,965 29	$172,517 37	$223,890 50	$57,681 51

REPORT OF THE

COLLEGE OF AGRICULTURE

UNIVERSITY OF MAINE

1911

The College of Agriculture came into existence at a time when the status of scientific agriculture was not so firmly established as now and its development has been comparatively slow. The rapid growth of the institution during recent years has long since demonstrated the correctness of the estimate placed upon the value of science in its application to agriculture, by those far sighted men who half a century ago succeeded in committing the United States to the policy of governmental encouragement for agricultural education. The general forward movement was slow in starting but now once under way the greatest problem that the College of Agriculture is likely to experience is in keeping pace with the responsibility placed upon it by a rapidly growing student body as well as by the demands made upon it by the great body of Maine farmers along the lines of extension service. It is the purpose of this report to review as briefly and concisely as possible the work of the College for the last fiscal year, including such other matter only as shall appear necessary to a clear understanding of the efforts made by the College to serve not only the resident students but the people of the State in an efficient manner.

COURSES OF STUDY.

The courses of study offered by the College, when divided according to character, comprise three main divisions—agriculture, forestry, and domestic science. When divided according to grade and time required to complete them they comprise the

four years or college course, the two years course, and the short courses of two to four weeks in length. The above courses may be summarized as follows: four years courses in agriculture, forestry, and domestic science; two years courses in agriculture and domestic science; short courses in dairying, horticulture, general agriculture, poultry management, and a summer course in agriculture, rural and social economics.

FOUR YEARS COURSES.

The four years courses lead to the degree of Bachelor of Science. A course in *agriculture* has been offered since the establishment of this institution but as the years have passed and the importance of the various lines of agriculture have become magnified, the need for specialized courses has appeared. The College has recognized these needs by the establishment of special or major courses; and students are given the opportunity to specialize in agronomy, animal husbandry, dairy husbandry, poultry husbandry, biology, and horticulture. It is planned to give the student not only a knowledge of the science but also a thorough training in the art of agriculture. A large number of graduates in agriculture go back to the farm and there is an ever increasing demand for well trained men to enter the service of Colleges, of High Schools, and of Academies as teachers of agriculture, of Experiment Stations as investigators, and of the State and United States Departments of Agriculture as experts.

The course in *forestry* trains men in the science and art of making the best use of the forest. It is designed to meet the needs of two classes of students,—1st, those who desire a general knowledge of forestry; 2nd, those who wish to prepare themselves for the profession of forestry. Students who complete the forestry curriculum are admitted to advanced standing in the graduate schools and are thus able to shorten the time required to obtain a Master's degree. They are also prepared to engage at once in practical work and thus far the opportunities awaiting graduates have been especially attractive.

The course in *domestic science* gives instruction in cookery, dietetics, marketing, sewing, serving, household economics, laundry work, and handwork. It also prepares women to

teach domestic science and elementary domestic art in normal schools and colleges. The basis of the course is the preparation of women to become efficient scientific housekeepers and ideal home makers.

TWO YEARS COURSES.

The two years courses in *agriculture* and *domestic science* are offered primarily for the benefit of those who are unable for various reasons, to spend a longer period in study at the University. The *two years course* in *agriculture,* or the *school course* as it is frequently called, aims to educate young men in the best practices in agriculture, equipping them so far as possible for conducting profitable farming operations. In this course most of the time is given to the leading branches of agriculture such as agronomy, animal industry, horticulture, veterinary science, and poultry husbandry, very little attention being given to subjects that do not relate intimately to the ones just named. On completion of this course in a satisfactory manner, students are granted a certificate by the University.

The *two years course* in *domestic science* aims to prepare women as teachers in home economics and elementary domestic art. Women may be admitted to this course without examination provided they are graduates of a recognized high school and have some practical knowledge of housework. A certificate is granted each student who completes the course in a satisfactory manner.

SHORT WINTER COURSES.

Short winter courses in general agriculture, dairying, horticulture, and poultry management are given. The courses in *general agriculture* and *dairying* begin each year on the first Tuesday in January and continue for four weeks; they are so arranged that a student registering in one of these courses can take the major or at least the more important parts of the other course. The *short course in general agriculture* deals especially with farm crops. Particular attention is given to the leading crops of the State, the preparation of seed bed, selection of seed, fertilization, culture, and harvesting. In addition, such other subjects as drainage, maintenance of soil

fertility, rotation of crops, control of weeds, etc., are studied.

The *short course in dairying* is designed to meet the requirements of creamery assistants, practical farmers, and herdsmen. The principles of animal nutrition, practices of feeding, breeding, judging stock, diseases of farm animals, milk testing, and butter making are carefully considered.

The *short course in horticulture* is offered for those who wish to learn the most approved methods of orchard management. Special attention is given to the selection of nursery stock, pruning, spraying, grading, and packing of fruit, and co-operation in the fruit business. The course usually begins on the Tuesday following the close of the course in dairying and continues for three weeks.

The *short course in poultry management* is intended as an aid to persons who wish practical knowledge in the handling of incubators and brooders, feeding and rearing of young chicks, general management of mature fowls, scoring and judging, killing, and marketing. This course is given during the first three weeks in February of each year.

SHORT SUMMER COURSE IN AGRICULTURE, RURAL AND SOCIAL ECONOMICS.

We realize today more clearly than ever before how intimate and vital are the relations between agriculture and the various professions and vocations. As a result, there is a wide and increasing interest in agriculture, both in its social and economic aspects, an interest that extends to all classes, whether they be city or country bred, whether their environment be urban, suburban, or rural.

Realizing its responsibility to all the people of the State, the College of Agriculture offers this course in the sincere hope that it may assist in bringing about a clearer perception of our common interests and thus result in the betterment of both city and country life. The course was first offered in the summer of 1911 and met with a ready response from clergyment and teachers in schools of secondary grade. The results were of such an encouraging nature that the course will again be offered in 1912, beginning on July 8th and continuing for two weeks.

SHORT COURSE EXPENSES.

Very few books are required in any of the short courses so that practically the only expense involved is for railroad fare, room, and board.

STUDENT STATISTICS.

Statistics relating to the student body in the College of Agriculture during the past few years present very interesting reading. They are interesting because they tell the story of progress, of rapid growth, of expansion.

Number of students registered in the various courses in 1911 in comparison with the number registered in 1906:

Courses.	1906.	1911.	Gain.	Percentage of gain.
Four years courses	29	139	110	379
Two years courses	10	61	51	510
Short courses	17	94	77	452
Total	56	294	238	410

Distribution of students as related to residence:

Maine—

Androscoggin county	18	Oxford county	21
Aroostook "	8	Penobscot "	67
Cumberland "	27	Piscataquis "	4
Franklin "	6	Sagadahoc "	5
Hancock "	6	Somerset "	16
Kennebec "	14	Waldo "	14
Knox "	8	Washington "	11
Lincoln "	2	York "	13
			240
Other states			54
Total			294

Percentage distribution of graduates from the four years and the two years courses according to present avocation:

Farming	64.8%	
Agricultural teaching and experimentation	12.5%	
State and U. S. Departments of Agriculture	4.7%	
Agricultural editors	1.5%	
Total in agricultural lines		83.5%
Business		10.9%
Professions		3.1%
Unknown		2.5%
Total		100 %

The above data relating to the lines of work in which the graduates are now engaged reveals the fact that so far as Maine is concerned a very large percentage of them return to the farm or are connected with teaching or research work in agriculture. This condition of affairs will, we feel sure, be appreciated by the people of Maine, for while the demand for men to take up teaching and research work in agriculture is great, it is very gratifying indeed that so many of our graduates are making practical application of the training they have received.

DEPARTMENTS OF INSTRUCTION.

AGRONOMY:—In the pursuance of this subject the student begins with a study of the soil itself, its origin, structure, and variation, together with its relation to moisture, heat, and air. The cultivation of the soil is investigated and its physical properties studied. Conditions which affect fertility receive due attention and the means by which fertility may be restored to partially depleted soils. This study involves the chemistry of the soil as well as that of barnyard manures and commercial fertilizers. The student receives instruction also in compounding and mixing fertilizers and in their application to the soil.

Crops are studied both in the laboratory and in the field and practice is given in crop judging with and without the score card. The growing of our common crops is considered, involving the choice of seed, fertilization, planting, cultivation, and

harvesting. The student is required to identify the prominent varieties of each crop and also our more common and pernicious weeds. A study is also made of the seeds of both crops and weeds. The principles of breeding are studied in connection with potatoes and the cereal grains, especial attention being given to the application of Mendelian principles. This work is begun in the class room and extended to the laboratory and field.

ANIMAL INDUSTRY:

Animal Husbandry—A study of the market and breed types of dairy cattle, beef cattle, sheep, swine, and horses, their handling and management, followed by practice in judging and in the use of score cards. Breeds and breed characteristics, the formation of flocks and herds, and the practices of successful breeders are considered. The food requirements of different animals, the composition and value of feeds, pasturing, soiling, calculation of rations and methods of feeding are investigated. Advanced work is given in the study of pedigrees, records, and the practices of successful breeders.

Dairy Husbandry—This includes the study of milk, the methods of testing, pasteurization, separation, and marketing. In connection with butter making, instruction is given in the ripening of cream, and the operation of dairy machinery. The course includes the handling of milk for city trade, milk inspection, certified milk plants, and the study of problems pertaining to the creamery. Some time is devoted to the theory and practice of cheese making, and advanced work is given those who wish to follow some particular line of dairying.

Poultry Husbandry—In this department, as in others, the principles which underlie the subject are taught as far as the length of the courses will permit. Beginning with a study of the types and breeds of market poultry, including ducks, geese, and turkeys, the student proceeds to an inquiry into the methods adopted by the large poultry farms, including feeds and feeding, egg production, incubation, brooding, housing, rearing, and feeding the young stock, and poultry fattening. With this is given laboratory practice in the drawing of plans of houses and appliances suitable for work on the farm, practice in the

mixing of feeds, examination of incubators, the killing and dressing of poultry, and the handling of eggs for market. In connection with the latter the matter of market requirements receives attention, together with the commission business, co-operation and cold storage.

Both market and fancy poultry are studied, and the methods of breeding, either for fancy or utility. A course in laboratory practice gives the student a thorough drill in the judging and scoring of the various breeds, and the selection, washing, and fitting of birds for exhibition. In the study of incubation, both the old and new methods are investigated, including the selection of eggs, the operation of incubators, and the setting of hens.

BACTERIOLOGY AND VETERINARY SCIENCE:

Bacteriology—The course in bacteriology is designed to familiarize the student with the morphological and biological characteristics of bacteria and the conditions under which they exist in the air, water, soil, and dairy products. The relations of bacteria to health and disease and the means by which immunity may be secured are also studied. Facilities are afforded for those students who wish to pursue some particular line of bacteriological investigations.

Veterinary Science—This course deals with the anatomy, physiology, and diseases of our domestic animals and poultry, and the means taken for the preservation and restoration of health. A clinic is open to all students in veterinary science. Due attention is given to the study of veterinary materia medica and pharmacy.

BIOLOGICAL AND AGRICULTURAL CHEMISTRY:

Biological Chemistry—It is the object of this study to acquaint the student with the chemistry of the plant and animal, from both the theoretical and practical standpoint. The composition of the plant is first studied, together with the source, nature, and assimilation of plant food. In like manner, the composition of the animal body, the changes taking place in the body, the digestion and assimilation of foods, respiration and absorption, and liberation of energy are also studied.

Especial attention is given to those plant and animal products which are used as foods.

Agricultural Chemistry—This course includes a study of the origin and composition of soils, the source and composition of fertilizing materials, the fixation of atmospheric nitrogen, and the chemistry of milk and other dairy products. Students desiring to become agricultural chemists receive instruction in the chemical analysis of fodders, fertilizers, milk, butter, and other dairy products.

GEOLOGY—While geology may be taught as a cultural subject, its applications to daily life are so many and varied that it is scarcely necessary to point them out. Agriculture owes much to this science, since it not only teaches the source and origin of the soil, and those soil constituents necessary to plant growth, but it also guides the geologist in his search for the stores of mineral fertilizers, nitrates, phosphates, and potash salts, upon which agriculture has come to rely.

The occurrence and treatment of alkali lands, the location of artesian wells, the possibilities of drainage and irrigation, and the discovery of peats, marls, and deposits of land plaster, clearly illustrate the importance of this study to the agricultural student.

BIOLOGY—Since agriculture consists in the production of such plants and animals as are useful to man, it follows that the study of life in its various phases is essential in an agricultural curriculum. A general course in this study deals with the fundamental principles of the science and forms the basis for further work in either zoology or botany. Types of vertebrate animals are studied, dissections are made, and the microscopic structure of the higher animals studied. Courses are also given in animal physiology, embryology, and advanced zoology. The study of the plant includes plant histology and physiology, while an advanced course in botany is given, consisting of laboratory and field work. A course in pharmaceutical histology is given with exercises in the detection of the common adulterants of familiar drugs. A study is made of the diseases of plants and the methods of combatting them. The student receives instruction in the trees and shrubs of the eastern states, especial attention being given to the forest trees of commercial value and their geographical distribution.

FARM MANAGEMENT and AGRICULTURAL ENGINEERING—The course comprises a study of the various types of farming, including the extensive, intensive, and mixed systems. It includes also the laying out of fields, the rotation of crops, cost of farming operations, and the like. The student becomes familiar with the use of surveying and leveling instruments, and their employment in the measurement of land and in the establishment of drainage systems. He also receives instruction in the planning, designing, and construction of farm buildings, water systems, and sewerage. A study is made of the machinery used on the farm, demonstrations and tests being made. Instruction is given in farm mathematics and its application to a system of records of the various operations of the farm, such as field labor, milk production, and crop yields.

FORESTRY—This course includes a study of the geographical distribution of forests and their relation to the welfare of the people as a whole. Forest maps are constructed accompanied with reports upon the condition of the mapped area and the types of forest growth. Practical instruction is given in thinning and planting forests, and in forest measurements. This includes work in determining the content of felled and standing trees, in cubic feet, cords, and board feet, and the means of determining the rate of growth, volume, and yield. Lumbering is considered from the economic standpoint, the student spending several weeks in a lumber camp, presenting the results of his observations in the form of a written report. The common commercial woods are classified as to their physical properties and their economic uses, and their mechanical, chemical, and other properties are studied.

HORTICULTURE—Following an introductory course, designed to cover in a general way the entire field of horticulture, a systematic study is made of the more important types and varieties of fruits. Instruction is given in the location of orchards, methods of setting, cultivating, fertilizing, pruning, and spraying. Students receive a thorough drill in the methods of picking, grading, packing, storing, and marketing fruit. The principles of vegetable gardening are taught and exercises given in the use of hot beds and cold frames. A study is made of greenhouse management and construction, supplemented by

practice in the regular greenhouse operations. The course includes the subject of landscape gardening and the improvement of the home grounds.

EQUIPMENT.

Farms—The College owns two farms, one connected with the campus and one located at Stillwater, about a half mile north of the campus. These two farms contain 473 acres, of which about 120 acres are in field crops, 50 acres of which is hay, 18 acres of oats, 19 acres of corn, and the balance made up of other grains, potatoes, roots, and forage crops. The whole system of cropping is planned and conducted so as to make it a large laboratory for the students and to provide feed for the herds and flocks. There are seven acres devoted exclusively to gardens, small fruits, and fruit trees, which serve as a laboratory for the men interested in this line of work. The campus occupies about 50 acres, the Experiment Station poultry plant 14 acres, the pastures about 90 acres, and the balance is timber and brush land which provides an opportunity for the forestry students to do practical work.

Winslow Hall—The home of the Agricultural College is 63x100 feet, has four floors and contains over forty rooms. In it are provided the offices, lecture rooms and some of the laboratories for the following departments: Agronomy, Animal Industry, Bacteriology and Veterinary Science, Biological and Agricultural Chemistry, Domestic Science, Extension Work, Farm Management and Agricultural Engineering, Forestry, Horticulture, and Poultry Husbandry.

The Stock Judging Pavilion is octagon in shape, and besides having a twenty-five foot ring, has a seating capacity for 400 people.

The Dairy Building is a two-story structure, 50 x 42 feet, and contains a milk room, creamery, refrigerator, and testing laboratory.

Barns—There are two *dairy barns,* which are used for storing feed, and for sixty head of cattle, representing five different breeds. Nine horses are kept on the farm, two of which are brood mares. They are used for student work in stock judging,

beside the farm work, and the general trucking of the University. In the sheep barn there are representatives of three breeds of sheep, and at the piggery three breeds of swine are kept.

The College Poultry Plant consists of an incubator building with storage and laboratory above, and brooder house attached, and in addition there is one long laying house, a fattening and killing house, besides numerous brooder and colony houses. Seven breeds of poultry are represented besides two breeds of geese and one of ducks. The whole plant is arranged so as to give the students facilities for instruction and practice.

Storage Houses—A large two-story building, used for the storing of fertilizer and farm machinery, is equipped with power to demonstrate the different makes of farm machinery in operation.

Greenhouses—Three greenhouses covering 3372 square feet of space, give the students an opportunity for practice in greenhouse management, and for the propagation of plants and the growing of vegetables, which they otherwise would be unable to get, due to the fact that most of the growing season comes during vacation.

Laboratories—The laboratories used by the various departments connected with the College of Agriculture were of satisfactory size at the time when the buildings in which they are located were built, but on account of the large number of students now taking the courses in Agriculture, Forestry, and Domestic Science they are outgrown and extra room will soon be necessary.

The whole equipment of the College of Agriculture has been planned with the idea of giving the student the greatest amount of instruction, and practical knowledge relative to agriculture; in other words, the student *studies agriculture,* not *about agriculture.*

EXTENSION WORK.

Agricultural Extension Work, or service as it is now sometimes called, aims first, to organize the great body of agricultural knowledge into workable form; second, to place in the actual field of agriculture traveling instructors, who have both training and experience and to distribute this knowledge or

information in such a manner that those engaged in farming will readily adapt the principles involved to their farming operations.

The College aims not only to teach the "why" but also to demonstrate the "how" of modern farming practice. In addition to the above, extension service aims to promote rural welfare, to upbuild community life and community institutions. Agricultural extension as we know it today is a product of very recent years. The need for extension work manifested itself many years ago and was the primary reason for the establishment of Agricultural Colleges and Experiment Stations.

That the Experiment Station has provided very efficient means for the investigation of agricultural problems, the rapidly accumulating body of agricultural knowledge testifies. "Searching for the truth" is the prime function of the Station. The function of the College is, however, along very different lines. Its special duty is to instruct resident students and for this purpose it goes into the realms of science and gathers the established facts so far as science relates itself to agriculture. It organizes these facts into teachable form and then it makes the application in such a manner as shall not only acquaint the student with the science but also make him proficient in the art of agriculture. The function of the College therefore is to "teach the truth" to resident students. These two institutions in their special functions of "searching for the truth" and "teaching the truth" have fitted exactly into the place they were designed to fill and at the same time developed the need for the organization of some special means for "spreading the truth." This need was quickly realized by both the College and the Station and steps were at once undertaken to solve the problem. The beginning was made in 1894 and marks the inception of what is now known as extension work. The movement was at first rather slow in getting under way but since the first few years very rapid progress has been made so that there is not a single Agricultural College in this country that is not now engaged in extension work more or less extensively, according to its financial ability. The College of Agriculture, University of Maine, was early in the field of extension work. The catalog for the year 1903-4 announced four distinct lines of extension

service—the school course, the short courses in general agriculture, dairying, horticulture and poultry management, correspondence courses, 8 in number, and lecture courses. Since then other lines such as co-operative experiments with fertilizers, grains, and grasses of various kinds; demonstrations in testing milk; pruning, grafting, and spraying of fruit trees; judging of grains, vegetables and live stock; special farming trains; Farmers' Week, and the issuing of publications of various kinds, have been added to the list.

We will now proceed to take up in turn the several lines of extension service the College of Agriculture has been engaged in during the past year.

SHORT COURSES: Five short courses in agriculture were offered during the year. Four of these courses were very similar to those offered in 1903, viz.: *general agriculture, dairying, horticulture,* and *poultry management.* A fifth course in *agriculture, social and rural economies* was given for the first time in the summer of 1911; the attendance on this course and the general approval given by those in attendance was of such a nature that the College feels encouraged to offer the course again next year. Eight years ago there were 18 students registered in the short courses; while in 1911 there were 94 students, representing a gain during the past eight years of 522 per cent.

The short courses are offered in recognition of the fact that there are many farmers who desire to receive instruction in the science of agriculture beyond the opportunity offered by an occasional lecture and who perhaps cannot afford either the time or expense necessary to complete the regular two or four years courses in agriculture. That the short courses are filling an important place in extension work is fully demonstrated by the increased registration of students and the practical results accomplished by those who have taken them.

CORRESPONDENCE COURSES: The College of Agriculture of the University was one of the first Colleges to organize and direct correspondence courses in the various phases of agriculture, and until recently it was the only Agricultural College in New England to offer such course. At the present time 11 different courses are given as follows:

1—Farm Crops and Crop Production
2—Farm Management
3—Feeding and Breeding of Farm Animals
4—Poultry Management
5—Fruit Growing
6—Forestry
7—Home Economics
8—Elementary Agriculture
9—Domestic Science
10—Vegetable Gardening and Small Fruits
11—Dairy Farming

These courses are given by means of text books and pamphlets. The pamphlets are furnished free but the student is expected to buy the text books used in these courses. Written questions are sent from time to time, giving the student an opportunity to express what he has learned in definite form by returning written answers to the questions. These answers are corrected by representatives of the College and returned to the student together with such suggestions as may appear necessary. The cost of the text books varies from 75c to $2 each. During the past year 134 new students have registered in these courses.

LECTURE COURSES AND DEMONSTRATIONS: For several years the College of Agriculture has offered lecture and demonstration courses for the benefit of Granges, agricultural societies, clubs, and organizations of various kinds. They have seemed to fill an important place with the people of the State. Requests for lectures and demonstrations have increased and the scope of the work has necessarily been enlarged to meet the additional demands. This line of extension work is participated in by the entire agricultural faculty and some of the instructors from the College of Arts so that lectures are offered covering nearly every phase of farm and community interest.

CO-OPERATIVE DEMONSTRATIONS: Co-operative demonstrations or experiments are very important phases of extension work. Agricultural extension is a business proposition; it should demonstrate as well as teach. In fact, demonstration is one of the very best forms of teaching; hence this phase of the work has received considerable encouragement on the part of the College and for several years co-operative tests have been carried on with a large number of farmers. These tests have

been made in every county in Maine and have included variety tests of farm crops, fertilizer tests, demonstrations of modern farm practice and orchard management. During the year 1911 the tests conducted were mainly with corn, oats, and alfalfa.

(a) *Corn:*—A large portion of the corn tests were conducted by young men and boys. The general plan on which they have been conducted is as follows: Several ears of corn varying from 2 to 10 in number have been sent to such persons as requested them. Report blanks have accompanied the seed. Each experimenter is expected to make a report promptly at the close of the season and to forward a sample consisting of 10 ears for exhibition purposes at the annual Farmers' Week.

(b) *Oats:*—The sample of oats sent out for experimental work consisted of four pounds of some leading variety. The oats used during the year 1911 were grown by the Maine Agricultural Experiment Station. Cultural directions and report blanks were furnished and each co-operator was required to forward to the College at the close of the year eight quarts of oats grown from the experimental plot.

(c) *Alfalfa:*—The demonstration tests with alfalfa are planned to cover a period of several years. The plots varied in size from one-third of an acre to one acre. The varieties of seed used were principally Grimm and Sand Lucerne. All of the experimental plots of alfalfa were visited by a representative of the College during the summer but no definite results can be reported before the close of another year.

(d) *The co-operative tests* conducted during the past year have been productive of much good. This has been especially true with corn, as indicated each year in the marked improvement in the quality of corn forwarded by experimenters to the College.

Co-operative Poultry Producers' Associations:—Co-operation in the marketing of poultry products offers splendid opportunity for development and progress. There is perhaps no other agricultural industry that is capable of bringing, under co-operative action, so immediate or so profitable results.

Farmers' Neighborhood Clubs:—Several Farmers' Neighborhood clubs have been organized during the past year and have served an important purpose in the development of community

pride and community interest. The College has co-operated with these clubs by giving lectures and demonstrations and by conducting correspondence courses with the members.

Boys' and Girls' Agricultural Clubs:—The College of Agriculture is co-operating with the State Department of Education and the State Grange in the organization of boys' and girls' agricultural clubs. Several clubs have been organized and the prospect seems good for rapid development in the future.

ANNUAL FARMERS' WEEK:—The annual Farmers' Week course was instituted five years ago in response to a demand on the part of the farmers of the State for a short course of practical instruction in agriculture for the benefit of those who could not spare the time for taking longer courses, and it has become one of the fixed extension courses given by the College. This course has been enlarged from year to year and is now given in three sections; thus allowing those in attendance to specialize to a considerable degree in the line of work taken. It is always held during the first full week in March, beginning on the first Monday evening of that month. During the last Annual Farmers' Week there were four hundred people in attendance. The feature of the course was the setting apart of certain days to be devoted especially to important phases of animal and plant husbandry. Sheep husbandry day attracted a large number of people from various sections of the State. During the day a special meeting of the Maine Sheep Breeders' Association was held, presided over by the President of the Association. The annual Farmers' Week has undoubtedly been the source of great inspiration and encouragement to the farmers of Maine and ought to be developed and made stronger each year. The total number of lectures and demonstrations given during the course were 80.

SPECIAL FARMING TRAIN:—A special Farming Train was run through Northern Maine over the lines of the Bangor & Aroostook Railroad from June 16th to 24th, inclusive. This train was run under the direction of the Bangor & Aroostook Railroad, College of Agriculture, Maine Department of Agriculture, and Maine State Grange. During the trip 30 different towns were visited and 67 lectures and demonstrations given to more than 8,000 people. The train was made up of three baggage coaches, one flat car, and two passenger coaches. The

baggage coaches were occupied by exhibits placed by the College of Agriculture, including live stock, poultry, dairy apparatus and appliances, poultry houses and appliances, fruit trees, insect and disease pests, farm crops, farm crop breeding, farm management, literature, and an exhibit from the veterinary science department. The two passenger coaches were used for lecture purposes and for the convenience of the instructional force consisting of 16 members.

PUBLICATIONS:—A small bulletin known as Timely Helps for Farmers is issued once each month during the entire year; the total number of copies distributed amounted to more than 30,000, and in addition circulars of information concerning various subjects have been issued and distributed as need has appeared. These publications are sent free to any person who may desire them. A list of available publications will be forwarded on request. All bulletins and circulars issued by the College are free.

CORRESPONDENCE WITH FARMERS:—This section of the extension department work has grown enormously during the past year. Many thousands of letters are annually received asking for advice in the solving of farm problems. These inquiries have been distributed to the various deaprtments and have received from them most careful attention.

MISCELLANEOUS:—There are many other lines of extension service in which the College of Agriculture is engaged such as the visiting of farms to give scientific and business advice, the identification of weeds, insects, and plant diseases.

PROPOSED WORK.

Demonstration Farms:—The demonstration farm is coming to be recognized as one of the most practical means for extension service. Such farms should be centrally located and easy of access to a large number of people. Upon the demonstration farm modern farming methods should be put in practice so that visitors could not only see the methods used and the results obtained, but also ascertain the net profit or loss resulting from each phase of the farming business. It aims to demonstrate not only methods but results. Already the College has had offers of several farms for demonstration purposes and it is

planned to undertake in a small way this permanent and perhaps most valuable form of extension work.

The Railroad Demonstration Car:—This service involves fitting up one or two railroad cars for demonstration purposes, placing them in charge of instructors and putting them in the field for continuous service. These cars will be handled on regular trains and dropped off in such towns along the line as may express a desire to have them. They will remain in the town from one to three days conducting demonstrations in the car, in public halls, and in the field. The next day the cars will be moved to the next town. To be most effective this service should be continuous, visiting towns at regular intervals or as often as the circuit can be completed.

Extension Schools:—It is hoped that the College will be able to hold several extension schools in various parts of the State during the coming year. Such schools are usually from three to six days in length, and are directed either along special or general lines, according as the needs of the community appear. Such schools are being worked out and carried on very successfully in some of our western states. In effect it would be like carrying the Farmers' Week course into the various sections of our State.

GENERAL.

The entrance requirements for the *four years courses* in agriculture, forestry, and domestic science are set forth in detail in the annual catalog of the University.

For the *two years course* 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 domestic science it is required that students should be graduates of 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 on application to the Dean of the College of Agriculture.

SPECIAL REPORT

OF THE

Maine Agricultural Experiment Station

FOR THE

COMMISSIONER OF AGRICULTURE

For the Year 1911

MAINE
AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE.

THE STATION COUNCIL.

PRESIDENT ROBERT J. ALEY,	*President*
DIRECTOR CHARLES D. WOODS,	*Secretary*
CHARLES L. JONES, Corinna,	*Committee of Board of Trustees*
SAMUEL W. GOULD, Skowhegan,	*Committee of Board of Trustees*
OSCAR R. WISH, Portland,	*Committee of Board of Trustees*
JOHN P. BUCKLEY, Stroudwater,	*Commissioner of Agriculture*
EUGENE H. LIBBY, Auburn,	*State Grange*
ROBERT H. GARDINER, Gardiner,	*State Pomological Society*
RUTILLUS ALDEN, Winthrop,	*State Dairymen's Association*

AND THE HEADS AND ASSOCIATES OF STATION DEPARTMENTS.

THE STATION STAFF.

ADMINISTRATION	CHARLES D. WOODS, Sc. D.,	*Director*
	BLANCHE F. POOLER,	*Clerk and Stenographer*
	GEM M. COOMBS,	*Stenographer*
BIOLOGY	RAYMOND PEARL, PH. D.,	*Biologist*
	EUGENE P. HUMBERT, PH. D.,	*Associate*
	MAYNIE R. CURTIS, A. M.,	*Assistant*
	WALTER ANDERSON,	*Poultryman*
	LOTTIE E. McPHETERS,	*Computer*
CHEMISTRY	JAMES M. BARTLETT, M. S.,	*Chemist*
	HERMAN H. HANSON, M. S.,	*Associate*
	ALBERT G. DURGIN, M. S.,	*Assistant*
	ALFRED K. BURKE, B. S.,	*Assistant*
	HARRY C. ALEXANDER,	*Laboratory Assistant*
ENTOMOLOGY	OSKAR A. JOHANNSEN, PH. D.,	*Entomologist*
	EDITH M. PATCH, PH. D.,	*Associate*
	ALICE W. AVERILL,	*Laboratory Assistant*
HORTICULTURE	WALTER W. BONNS, B. S.,	*Associate Horticulturist*
PLANT PATHOLOGY	WARNER J. MORSE, M. S.,	*Pathologist*
	CHARLES E. LEWIS, PH. D.,	*Associate*
	VERNON FOLSOM,	*Laboratory Assistant*
HIGHMOOR FARM,	WELLINGTON SINCLAIR,	*Superintendent*
	ROYDEN L. HAMMOND,	*Seed Analyst and Photographer*
	ELMER R. TOBEY, B. S.,	*Inspector*
	ALBERT VERRILL, B. S.,	*Inspector*
	EDGAR WHITE,	*Inspector*
	CHARLES S. INMAN,	*Assistant*

THE WORK OF THE MAINE AGRICULTURAL EXPERIMENT STATION IN 1911.

DIRECTOR CHAS. D. WOODS.

For many years the full report of the Station was published in the "Agriculture of Maine" as part of the report of the Commissioner of Agriculture. As the work of both the Department and the Station increased this became impracticable because of the size of the resulting volume. While Hon. A. W. Gilman was the Commissioner of Agriculture he printed a few of the Station Bulletins as a part of his Report. The present Commissioner thinks that the purpose of publicity would be better accomplished by a brief report covering the whole of the work of the Station for the year than by reprinting two or three of the bulletins on special features of Station work. At his request the following has been prepared and is submitted for publication as part of the "Agriculture of Maine" for 1911.

HISTORICAL SKETCH.

The Legislature of 1885 enacted a law establishing the Maine Fertilizer Control and Agricultural Experiment Station. The purpose of the Station as defined in Section 1 of the act was as follows: "That for the purpose of protection from frauds in commercial fertilizers, and from adulterations in foods, feeds and seeds, and for the purpose of promoting agriculture by scientific investigation and experiment, the Maine Fertilizer Control and Agricultural Experiment Station is hereby established in connection with the State College of Agriculture and Mechanic Arts." The act was approved by the Governor March 3, 1885, and early in April the Station was organized with a director, who was also chemist, an assistant chemist, and an assistant in field and feeding experiments.

It depended for its quarters upon the hospitality of the Maine State College. A chemical laboratory for the Station was partitioned off from the College laboratory and supplied with apparatus. Part of the dairy room of the College was fitted up with apparatus for use in experiments involving the handling of milk. A part of the new barn just erected by the College was turned over to the Experiment Station for feeding experiments and was fitted up with stalls, scales, etc. Field experiments were started by laying off about three acres of land into blocks, and box experiments for growing plants were also begun.

While the principal object of the establishment of this Station was the maintenance of a fertilizer control, in the first months of existence lines of investigation were entered upon, many of which have been continuously followed by this Station.

The Maine Fertilizer Control and Agricultural Experiment Station existed about two and a half years and issued 26 bulletins and 3 reports, the former being published only in the leading papers of the State and the latter as a part of the report of the Maine Board of Agriculture. Upon the passage by Congress of what is known as the Hatch Act, establishing agricultural experiment stations in every state, the Legislature of 1887 repealed the law of March 3, 1885, by an act which took effect October 1, 1887. It was expected at the time this act was passed, that by October first a station would be in operation under the provisions of the national law. This did not prove to be the case, owing to the failure of Congress to appropriate money, and had not the College assumed the risk of advancing the funds to pay the expenses of the Station, work would have ceased on the date in which the old station law stood repealed. As it was, the work was continued until January 1888, when the station force disbanded to await the action of Congress. It was not until after the passage of the deficiency bill early in February, 1888, that the funds became available for the payment of the expenses of the year 1887-1888. Prior to this, the Maine Legislature of 1887 had accepted the provisions of the Hatch Act on the part of the State, and at the meeting of the College Trustees in June, 1887, the

present Station was organized as a department of the College by the election of a director and two other members of the staff of officers.

At a meeting of the trustees, held February 16, 1888, a general plan for carrying out the provisions of the Hatch Act, involving the expenditure of $15,000 per annum, was presented to the Board of Trustees and was accepted by them, and the development and management of the Station under this plan was placed in charge of a Station Council, made up of the President of the College, the Director of the Station, the heads of the various departments of the Station, three members of the Trustees and a representative from each of the State agricultural organizations.

The Station Council meets once a year. At this meeting, the Director and other members of the station staff outline the work which has been undertaken in the past year and make recommendations for the following year. Such of these as commend themselves to the Station Council as well as suggestions from that body are approved and the Director is instructed to carry them out in detail. The appointment of members of the staff is made by the Trustees, and the recommendations of the Council are subject to their approval.

The Director is the executive officer of the Station and passes upon all matters of business. The members of the Staff have charge of the lines of work which naturally come under their departments.

INCOME OF THE STATION.

For the year which ended June 30, 1911, the income of the Station in round figures was:—Hatch Fund $15,000; Adams Fund $15,000; U. S. Department of Agriculture for poultry investigations $1,000; State printing $5,200; Inspections $11,500; Sales $1,900. All of the receipts and expenditures are audited by the State Auditor and those from the Federal Government by the Office of Experiment Stations of the U. S. Department of Agriculture.

RELATION OF THE STATION TO THE UNIVERSITY OF MAINE.

The Station is by act of legislature a department of the University of Maine and in the organization of the University

is coordinate with the different colleges. The function of the colleges is to teach. It is by the Act of Congress establishing the Station, "The object and duty of said experiment stations to conduct original researches or verify experiments . . . bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States or Territories." None of the funds received by the Station can lawfully be used for teaching, for demonstration, for exhibition purposes or for any purpose whatever outside of research into agricultural problems.

DEMONSTRATION EXPERIMENTS AND EXHIBITIONS.

The distinction which may be readily and sharply drawn between work of investigation and work of teaching becomes somewhat dimmed to people not accustomed to such distinctions when demonstration experiments and exhibitions are concerned. For instance the Station may have proven by experiment that a certain fruit disease can be controlled by spraying with a certain preparation and may be asked to go to a man's orchard and conduct an "experiment" the whole object of which is not to find out something not known but to show the man and his neighbors how to do the work. For the extension department of the College that is legitimate work but it is not work, however important and desirable it may be, that the Station has any right to do, for its funds are appropriated for something entirely different.

The Station may be asked to make exhibits of the crops that it has grown at some State or National show, but it must refuse. Not that the Station is not interested in the show if it is for the development of agriculture but because the work of the Station is limited to investigation and not teaching. It is perfectly proper for the College to exhibit for the purpose of instruction. It can take the crops, for instance, grown by the Station and make exhibits of them to teach the visitor at the show. But it would be unmoral for the College to exhibit for the purpose of competing for a prize. It has been stated that if the apples grown in 1911 at Highmoor Farm had been exhibited at the New England show Maine would have won the

prize. Even if the managers of the show would have admitted the College which could have prepared the exhibit to compete and even supposing it had won, it would have been absolutely wrong for fruit produced by the use of public money to have competed against private efforts and capital.

The College may teach by demonstration and by exhibition. The Station can lawfully do neither. The College cannot morally compete for prizes against private exhibits. To some it seems that if a thing is desirable for the good of Maine's agriculture, it is the province of the Station to do it. Agricultural writers have pointed out many things that they think, for instance, the Station could do at Highmoor Farm, without considering the limitations advisedly put upon the Station's activities by both State and National law.

WORK OF INSPECTION.

While the work for which the Experiment Station was primarily established is that of investigation it has been found much more convenient for the State, because of the Station laboratory facilities, to make the Director of the Station the executive officer of the laws regulating the sale of agricultural seeds, commercial feeding stuffs, commercial fertilizers, drugs, foods, fungicides and insecticides, as well as calibrating the creamery glassware used in the State.

This work is distinctly organized from that of investigation and the funds for investigation are in no wise used for inspection work. Part of the time of the Director and two other members of the office force, the whole time of four chemists and three inspectors, are given to the work of inspection. Hundreds of business places and manufactories in the State are visited during the year by the inspectors and thousands of analyses are made in the laboratories. The results of the inspection for 1911 were published in Official Inspections 29 to 35, aggregating 136 pages. They are only thus briefly referred to here as they are of only fleeting interest.

DISSEMINATION OF INFORMATION.

It is not the function of the Station to disseminate general agricultural or other information. That is for the College

through its extension department. It is, however, the distinct duty of the Station to publish the results of its investigations. Although the correspondence that bears upon general agriculture is referred so far as practicable to the correspondence department of the University the letters attended to by the Station are numerous. By actual count the letters received during the first week in February, 1912, when this special report was being prepared, numbered 834. Not all of these required letters in reply as in many instances sending a publication met the need. But they were all handled the days they were received. During the year the following are the principal publications although there were numerous circulars not here listed as well as more pretentious papers that were printed in scientific periodicals, both American and foreign.

LIST OF PRINCIPAL PUBLICATIONS IN 1911.

Work of Investigation. (Bulletins.)

No. 187. Insect Notes for 1910.
No. 188. Field Experiments.
*No. 189. Orchard Spraying Experiments.
No. 190. Two Species of Macrosiphum.
No. 191. Method for Determining Weight of Parts of Eggs.
No. 192. Breeding for Egg Production.
No. 193. Poultry Notes.
No. 194. Control of Blackleg Disease of the Potato.
No. 195. Insect Notes.
No. 196. Fungus Gnats. Part III.
No. 197. Finances and Index.

Work of Inspection. (Official Inspections.)

No. 29. Fertilizer Inspection.
No. 30. Oysters, Pork Sausages, Clams, Imitation Beer.
No. 31. Feeding Stuff Inspection.
No. 32. Changes in Inspection Laws.
No. 33. Fertilizer Inspection.
No. 34. Spices, Prepared Mustard, Honey and Gluten Flour.
No. 35. Food Sanitation.

Miscellaneous.

No. 398. Poultry Diseases.
No. 408. Plant Lice of the Apples in Maine.
No. 435. Proper Growing and Handling of Potato "Seed" Stock.

* Edition exhausted.

All publications are distributed free to residents of Maine. The demand for the Station bulletins outside of the State has made such inroads upon the printing fund that a price is put upon them to non-residents with the exception of exchanges, scientific investigators and libraries.

EQUIPMENT OF THE STATION.

The Station is well equipped in laboratories and apparatus, particularly in the lines of chemistry, entomology, horticulture, pomology, plant pathology and poultry investigations. Its poultry plant is probably the most complete for the purposes of investigation of that of any Experiment Station in the country. While the Station carries on some co-operative work such as orcharding, and field experiments with farmers in different parts of the State, most of its work of investigation is of necessity carried on in its own laboratories and greenhouses and upon Highmoor Farm situated in the town of Monmouth.

Its offices and laboratories are chiefly located in Holmes Hall (named in honor of Dr. Ezekiel Holmes, the first Secretary of the Board of Agriculture) on the University of Maine campus, Orono. It is a two story brick building, 81x48 feet. On the ground floor are five large chemical laboratories used for the analysis of foods, feeding stuffs, drugs, fertilizers, fungicides and insecticides; the laboratories of the plant pathologists; and two of the biological laboratories. The general office and mailing room, the Director's office, the laboratory for seed testing and photography, the entomological laboratories and the library, are on the second floor. In the basement there is a chemical laboratory; rooms for the grinding and preparation of samples; culture and preparation rooms used by the plant pathologists and rooms for the storage of chemicals and glassware. The large attic is also used for the storage of samples and supplies. The building is connected with the steam heating plant of the University; is supplied with gas and electricity; and is thoroughly equipped with apparatus for the work of agricultural investigation. The library consists of about 3000 volumes, chiefly agricultural and biological journals and publications of the various experiment stations. Holmes Hall is situated near the University Library and card catalogues of books in the University Library that are likely to be used by the station workers are also in the Station Library.

The poultry plant is also situated on the University of Maine campus and includes two long houses built on the curtain front plan. It is possible in these houses to carry over the winter from 800 to 1000 laying hens. One of these long poultry houses is used for pedigree breeding work during the breeding season in the spring. In this house it is possible to carry from 200 to 300 breeding hens in such condition that the exact pedigrees of their offspring may be recorded. The entire portion of the poultry plant devoted to laying hens is equipped with an improved form of trap nest which makes it possible to obtain exact records of the egg production of each individual bird. Besides these two laying houses the poultry plant has a house 36x16 feet which is divided into three compartments used for hospital purposes in connection with the experimental work of the department and for special physiological investigations with poultry. The incubator house and brooder houses include ample facilities for the annual hatching and rearing of about 4000 pedigreed chickens during the breeding season from April 1 to June 1. There is also a well equipped laboratory on the poultry range that is chiefly used and especially equipped for physiological work. It includes three rooms arranged in a linear series. The outer one of these rooms is devoted to general laboratory purposes and the conducting of post-mortem examinations on poultry. The two inner rooms are devoted to experimental physiological work. The first of these rooms is the sterilizing room and is equipped with the usual instruments and facilities for the sterilization of instruments, etc., including steam and hot air sterilizers. The last room in the series in this laboratory is the experimenting room. The rooms are so constructed as to be practically dust proof, and the walls and ceilings are entirely covered with white enamel which makes it possible to thoroughly sterilize the rooms.

HIGHMOOR FARM.

The State legislature of 1909 purchased a farm upon which the Maine Experiment Station "shall conduct scientific investigations in orcharding, corn and other farm crops." The farm is situated in the counties of Kennebec and Androscoggin and

largely in the town of Monmouth. It is on the Farmington Branch of the Maine Central Railroad two miles from Leeds Junction. A flag station called Highmoor is on the farm.

The farm consists of 225 acres, about 200 of which are in orchards, fields and pastures. There are in the neighborhood of 3000 apple trees upon the place which have been set from 15 to 25 years. The fields that are not in orchards are well adapted to experiments with corn, potatoes, and similar general farm crops. The house is two story with a large wing, and contains about 15 rooms, well arranged for the Experiment Station offices and for the home of the farm superintendent. The barn is large, affording storage for hay and grain. The basements of the building afford a moderate amount of storage for apples, potatoes and roots.

Although the farm is used as a laboratory by the different departments of the Station and some of the work in progress upon the farm is described in other parts of this report it may be of interest to briefly note the more important investigations that were carried on upon the farm during the growing season for 1911.

FIELD EXPERIMENTS, 1911.

Rotation Experiment.

The object of this experiment is to ascertain the differences in yields and in the exhaustive effects of corn and potatoes in relation to land treated with chemical fertilizers and with organic manure. The whole field was planted to potatoes on chemical fertilizer in 1910. It is to be seeded to grass with oats in 1912.

Plot 3 A. One acre Green Mountain potatoes (planted 3 1-2 inches deep), with 1700 pounds of 4-8-7 chemical fertilizer.

Plot 3 B. One acre sweet corn (planted 18 inches in the row), with 1700 pounds 4-8-7 chemical fertilizer.

Plot 3 C. One acre sweet corn (planted 18 inches in the row), with 600 pounds 4-8-7 chemical fertilizer plus 8 cords manure.

Plot 3 D. One acre Green Mountain potatoes (planted 3 1-2 inches deep), with 600 pounds of 4-8-7 chemical fertilizer plus 8 cords manure.

Because of failure to obtain an even stand of sweet corn this experiment will be recommended in 1912.

Cyanamide Fertilizer Experiment.

The object of this experiment is to test the efficiency of a chemically prepared nitrogen supplying fertilizer, known as cyanamide, with the other forms of nitrogen fertilizers now in common use.

Three plots of one acre each, planted to Irish Cobbler potatoes, 3 1-2 inches deep, treated uniformly in respect to phosphoric acid and potash. Nitrogen fertilizers as follows:—

Plot 6 A. 190 pounds nitrate of soda plus 425 pounds dried blood.
Plot 6 B. 385 pounds cyanamide plus 190 pounds nitrate of soda.
Plot 6 C. 580 pounds cyanamide.
This experiment will be repeated in 1912.

Potato Cultural Experiment.

This is a continuation of the experiment started in 1910. comparing the results of planting at different depths with different cultural methods. Three plots of land of one and one-eighth acres each are planted to Irish Cobbler potatoes, treated with 1700 pounds of 4-8-7 chemical fertilizer (1000 pounds in the hill, 700 pounds worked in).

Plot 7 A. Planted 2″ deep. To be highly ridged.
Plot 7 B. Planted 5″ deep. To receive level culture.
Plot 7 C. Planted 3 1-2″ deep. To have a low ridge.
This experiment is planned to extend over 5 years.

"Mineral Fertilizer" Experiment.

A comparative test of the New England Mineral Fertilizer with barnyard manure and with complete chemical fertilizer, on corn and potatoes. New England Mineral Fertilizer does not carry soluble plant food in any amount and is not at all similar to ordinary fertilizer. Six one-twentieth acre plots, A, B, C, D, E, F, running in order from south to north.

Plot A. Corn, fertilized with 1-4 cord barnyard manure plus 25 pounds 4-8-7 chemical fertilizer.
Plot B. Corn, treated with Mineral Fertilizer.
Plot C. Corn, check—no fertilizer.
Plot D. Potatoes, fertilized with 90 pounds 4-8-7 chemical fertilizer.
Plot E. Potatoes, treated with Mineral Fertilizer.
Plot F. Potatoes, check—no fertilizer.
It is planned to repeat this experiment in 1912.

Top Dressing on Grass.

The second year of an experiment comparing acid phosphate and Thomas slag as a source of phosphoric acid. Plots 11 A and 11 C each receive 112 pounds of muriate of potash and 100 pounds of nitrate of soda. Plot 11 A has in addition 600 pounds of high grade soluble acid phosphate. Plot 11 C has 600 pounds of Thomas phosphate powder. Plot 11 B received no top dressing of any kind.

This experiment will be continued one more season.

EXPERIMENTS WITH THE APPLE, 1911.

Experimental Nursery.

About an acre has here been reserved for the growing of young apple trees to be used later in experimental plots. There are two thousand

one year old French Crab seedlings for budding or grafting, and about one thousand grafts of Tolman Sweet cions root grafted on French Crab, for experimental work.

Orchard Spraying Experiment.

This is a continuation of last year's work, modified by the results obtained, and is a test of the home made concentrated lime-sulphur spray as a fungicide used at different strengths, with arsenate of lead as the insecticide. Tests of arsenate of lead as a fungicide are also included. One plot of trees is treated with Bordeaux mixture for comparison. No trees have this year been left unsprayed for insects, as the desirability of spraying has been fully established.

There are 25 rows in the experiment. The first six trees in each row are treated as follows:

Rows 1 to 3, inclusive, arsenate of lead at the rate of 4 pounds to 50 gallons of water.

Rows 4 to 9, inclusive, home made concentrated lime-sulphur solution, used one-fifth stronger than the strength recommended by the latest dilution tables, with 2 pounds arsenate of lead to 50 gallons of water.

Rows 10 to 15, inclusive, the same lime-sulphur solution used at the dilution recommended, according to its density, plus 2 pounds arsenate of lead to 50 gallons of water.

Rows 16 to 21, inclusive, the same lime-sulphur solution used at a dilution one-fourth weaker than the strength recommended by the latest dilution tables, plus 2 pounds arsenate of lead to 50 gallons of water.

Rows 22 and 23, arsenate of lead, at the rate of 2 pounds to 50 gallons of water.

Rows 24 and 25, Bordeaux mixture of the 3-3-50 formula, plus 2 pounds arsenate of lead to 50 gallons of water.

Orchard Management Experiments.

13 B. Rows 4 to 12, inclusive, beginning with the seventh tree in the respective rows, are fenced off for sheep pasture. The object of this is to determine the effect of pasturing sheep in orchards as a means of fertilizing the soil and keeping down the grass.

13 C. Rows 13 to 18, inclusive, beginning with the seventh tree in each row, are fenced off for pasturing with hogs, for a similar reason.

13 D. Rows 19 to 25, inclusive, beginning with the seventh tree in each row, have been left in grass, to compare with the cultivated and pastured plots.

13 E. Rows 26 to 30, inclusive, throughout their entire length, have been dressed with barnyard manure at the rate of 6 cords per acre, to compare this means of fertilizing with the three preceding plots and with 13 F.

13 F. Rows 31 to 35, inclusive, have been treated with the complete 4-8-7 chemical fertilizer at the rate of 1000 pounds per acre.

All of the plots included in section 13 have been pruned and sprayed; all excepting 13 D. are cultivated, and all excepting 13 E. have been fertilized with 4-8-7 chemical fertilizer at the rate of 1000 pounds per acre.

These orchard management experiments are to be continued in order to obtain data covering long periods of time.

Fertilizer Experiment on Apple Trees.

Thirty-two Baldwin trees have been divided into three sections. Ten at each end have been treated with 4-8-7 chemical fertilizer at the rate of 1000 pounds per acre plus nitrate of soda at the rate of 100 pounds per acre. The 12 trees in the middle of the row have received the 4-8-7 chemical fertilizer at the rate of 1000 pounds per acre.

The Baldwin orchard (25 on map), has also been divided into two parts for a ferilizer test. Rows 1 to 26 inclusive, (beginning at the north end of the orchard), have received the 4-8-7 fertilizer at the rate of 1000 pounds per acre plus nitrate of soda at the rate of 100 pounds per acre. The remainder of the orchard has received the 4-8-7 formula at the rate of 1000 pounds per acre.

Apple Breeding Experiment.

The object of this experiment is two-fold; to produce an apple of desirable characters better adapted to Maine conditions than the commercial varieties now grown, and to study the fruits produced by breeding, in relation to laws of inheritance.

The work of this season has of necessity been preliminary in nature, and has been chiefly concerned with a study of the technique of crossing, to determine the methods for securing an adequate per cent of fruits from artificially pollinated blossoms. A considerable number of blossoms have been so pollinated, and the resulting fruits will be the basis for future work.

Studies of the seedling progeny of a number of standard varieties are also being made in connection with the above.

PLANT BREEDING EXPERIMENTS, 1911.

Sweet Corn.

Experiments with sweet corn were begun at Farmington in 1907.

Plot No. 3 C. on map is a continuation of this work, and consists of an ear-to-row-test of 36 ears. These ears are all pedigreed for four generations back. Each one is selected from an exceptionally early and good yielding strain.

Yellow Dent Corn.

Preliminary experiments with dent corn were conducted at Farmington 2 years ago. This work was continued at Highmoor last year.

Plot No. 10 on map is planted with a variety of corn originally obtained from Mr. Hiram Cornforth of Waterville. This plot consists of 50 rows planted on the ear-to-row system. These ears were selected from last year's breeding plot, with special references to desirable qualities. Many were hand pollinated last year. This plot will furnish interesting data on the effect of inbreeding in corn.

Hybrid Corn.

The chief object of this experiment is to accumulate scientific data regarding heredity. In 1908 there was obtained a quantity of seed which was a cross between Cornforth's yellow dent and Dennett sweet corn. In the second generation this hybrid corn breaks up into four more or less distinct types. On the same ear there occur yellow sweet kernels and white sweet kernels. These four kinds of corn, as well as some of the first hybrid generation were grown last year. This year the experiment is being continued along the same lines. In this plot an experimental planting of a tassel-ear (a small ear borne on the tassel or spindle) has been made.

Pedigree Oats.

This year the seed from the individual oat plants, selected from last year's plots because of their excellence in one or more qualities, is planted on the head-row system. 25 grains from each of 219 selected heads are planted in short rows in the oat-breeding garden No. 5. The visitor should note the many different types to be found among these pedigree oat rows. Next year the best of these rows will be used for further propagation.

Beans.

This plot contains the beginning of an experiment in breeding yellow-eyed beans, of both the old-fashioned and improved varieties. One bean was planted to a hill, each hill thus becoming the foundation of a pedigree line or strain. Strains embodying desirable characters will be further propagated.

Variety Test of Oats.

The object of this variety test is two-fold. First, to demonstrate the great difference in the yield and other characters of the different varieties. Second, to form the basis of a series of breeding experiments with oats. The variety tests this year are a continuation of those of last year.

There are 17 plots in all, each containing one-tenth of an acre. The oats were put in with a disc grain drill and sown at the rate of 2 bushels (by measure) per acre. Each plot is planted either with a different variety or in case there is more than one plot of the same variety, the seed came from different sources. The following list gives the variety and the source of the seed for each plot.

There were also experiments conducted by the entomologists and by the plant pathologists in more or less co-operation with the horticulturist that are not here listed.

BIOLOGY.

The Department of Biology is chiefly engaged in the study of plant and animal breeding. The final goal of this work is to find out how the common farm crops and live stock may be improved in quality and productivity by breeding. On the animal side the experimental work is largely with poultry, while on the plant side corn, oats and beans have been the crops chiefly studied.

WORK WITH POULTRY.

During nearly the whole existence of the Maine Agricultural Experiment Station it has carried on work with poultry along one line or another. Two phases of the poultry work of this Station have attracted wide attention, namely its experiments in breeding for increased egg production, on the one hand, and in poultry management on the other hand. In recent years an increasing amount of attention has been paid to the former line of work. This is warranted by the great practical importance to agriculture of the subject of breeding for performance in general. Not only will a working out of the fundamental principles upon which successful breeding for egg production depends be useful and valuable to the poultryman, but also to the breeder of any kind of live stock who is seeking to improve utility qualities. Poultry probably furnishes more favorable material for working out the laws of inheritance and breeding than any other of the domestic animals.

BREEDING FOR EGG PRODUCTION.

The work in breeding for increased egg production is now drawing to a close. During the past year the essential features of the mechanism by which egg production is inherited have been finally worked out. These final results will be published during the present year, thus completing an investigation which has engaged the attention of the Station for over 14 years.

The results to date of this work in breeding for increased egg production may be summarily stated as follows:

Summary of Early Experiments.

An experiment in which the highest laying hens were used as breeders showed that mass selection for high production on the basis of the trap nest record of the individual alone did not, as a matter of fact, result in a steady continuous improvement in average flock production, even though it was continued for a period of ten years.

A further experiment along the same line showed that the daughters of "200-egg" hens with from six to nine years selected ancestry (on the basis of trap nest records) behind them were no better layers, on the average, than birds bred from the general flock.

There is no evidence that either (a) the method of housing, or (b) of feeding, or (c) the fact that the chicks were throughout the period of the experiment hatched in incubators and reared in brooders, or (d) the fact that some degree of inbreeding was practiced during the mass selection experiment had anything whatever to do with the outcome of that experiment.

It has been shown that during the period of selection the adult mortality decreased. It has further been shown that at the present time, in spite of the fact that there has been no change in the method of hatching and rearing by artificial means, the records of hatching and of chick mortality are such as to give no indication whatever that the strain of Barred Plymouth Rocks which has been used in all the work in breeding for egg production has become in any way deteriorated through the action of environmental or other factors. It has further been specifically shown, by an experiment in out-crossing involving a large number of individuals, that the infusion of new blood into this stock failed to produce any change in the egg production of the progeny. Such a result makes it impossible to suppose that the degree of inbreeding practiced during the mass selection experiment can have had anything whatever to do with the results of that experiment.

New Plan of Breeding.

In the laying year 1907-08 a new plan of breeding was adopted as a working hypothesis to be tested by experiment. This plan is based on the employment of individual pedigree

records and has its theoretical foundation in the genotype concept of Johannsen. This working hypothesis involves the following factors:

(a) That the egg record of an individual hen gives no definite indication whatever as to what the probable laying of her daughter will be. Examination of hundreds of pedigree records leaves no doubt as to the truth of this fact. Individual birds with high egg records are as likely as not to produce daughters that make poor egg records and vice versa. From the laying record of an individual hen it is quite impossible for anyone to tell whether its progeny will be good layers or poor layers.

(b) A flock of hens, no matter how "pure bred" it may be, is really not a homogeneous, unitary aggregation, but instead it is made up of a varying number of lines or strains, each of which tends to breed true to a certain definite degree of egg productiveness or fecundity. In other words such a flock is a mixture of several component *lines*. The individuals in each line tend to produce offspring true to the type of the line rather than to the type of the population as a whole, excepting in cases where by chance the population type and the type of one or more lines happen to be the same.

(c) When mass selection alters the population type it does so by a process of isolating from the mixture certain strains whose own types are different from the original general population type and which differ in the direction toward which selection is made. The thing to be sought, then, in the practical breeding of poultry for increased egg production is to discover by means of pedigree analysis those individuals of the general flock which possess high fecundity in inheritable form. These individuals may then be isolated and propagated and improvement thus brought about.

Results of New Plan.

It has been shown that by the application of this new plan of breeding it has been possible to isolate from the same stock of birds which was used in the mass selection experiment, pedigree lines or strains which for five generations (the time covered by the experiment to date) have bred uniformly true to definite degrees of egg production. In this work there have

been isolated and are now being propagated lines carrying high egg productiveness, and lines carrying low productiveness, the character apparently being definitely fixed in the pedigree line or strain in each case.

In order to determine the mechanism by which fecundity is inherited more data are needed. From the evidence in hand, however, it is now clear that this character is inherited fundamentally according to Mendelian principles. High fecundity and low fecundity segregate definitely following crosses between breeds of poultry bearing these characters as definite breed characters. Further studies on this phase of the problem are now in progress.

A complete account of this work in breeding for egg production is given in Station Bulletin 192, copies of which will be sent on request to residents of Maine as long as the supply lasts.

LAWS OF EGG LAYING.

In connection with this study of the inheritance of egg production investigations regarding the laws of egg laying in poultry in general have been made. During the past year there has been published by the Department of Agriculture at Washington as Bulletin 110, Part II, of the Bureau of Animal Industry, an extensive memoir prepared in the Department of Biology of the Station, on the distribution of egg production in different seasons of the year. A summary account of the results of this study follows.

Seasonal Distribution of Egg Production.

The data on which this study was based are the trap nest records of Barred Plymouth Rocks collected at the Maine Experiment Station, involving detailed monthly egg records of more than 2400 birds, collected in a period of nine consecutive years.

The mean of average monthly egg production exhibits the following characteristic changes in the course of the laying year: (a) The lowest mean production of the year is in the month of November. (b) The mean monthly production increases in December and January at a relatively very rapid rate. (c)

There is a slacking up in the rate of increase in February, which probably represents the point of the ending of the first, or winter, cycle of egg production. This February slacking up amounts in many cases to an actual decrease in productiveness as compared with the point attained in January. (d) The mean production reaches a maximum in March. (e) While the mean production for April is practically the same as that for March, there is a steady decline after April on to the end of the laying year in October. (f) There is a tendency toward a slightly larger drop in mean production in May. This is the period of natural broodiness.

The present data indicate that only a trifle more than a quarter of the total eggs produced are laid in the winter third of the year (November 1 to March 1). In the first two-thirds of the laying year approximately three-fourths of the total eggs are produced. The month of maximum productivity varied in the experiments furnishing the present data with the methods of housing. In a closed, warmed house the month of maximum production was April; in a curtain-front house it was March. The greatest relative variability in egg production is at the beginning of the laying year (month of November). The month of lowest variability, both absolute and relative, is April.

The laying year may be divided into four natural periods or cycles with reference to egg production. The first of these periods (roughly November 1 to March 1) is the winter period, wherein egg production is essentially a non-natural (i. e., forced or stimulated) process. The second or spring period (March 1 to June 1) is the natural laying period of the domestic fowl in its normal reproductive cycle. The third (roughly June 1 to September 1) and fourth (roughly September 1 to October 31) periods are not sharply separated from one another. The summer egg production represents in part a natural continuance of the normal breeding season (rearing of a second brood by wild *Gallus*) and in part a stimulated process. This period is terminated by the molt, which is the characteristic feature of the fourth period.

There is no evidence that the continued selection for higher egg production practiced during the eight years covered by the experiment produced any increase whatever in the mean egg

production of any month in the year. On the contrary, the mean production in all but two of the months actually decreased during the period of selection. So far as there was any change whatever in variability in monthly egg production during the period when selective breeding was practiced, this change was not in the direction of a reduction as a result of the selection, but, on the contrary, there was an actual increase in variability in all but one month of the year, and here the plotted variability line did not sensibly deviate from the horizontal.

The present statistics show no bad effect on egg production in the winter months (November to March) of keeping birds in large and crowded flocks (up to the limits included in the present study). On the other hand, overcrowding tends distinctly to lower summer (and to a small extent spring) egg production. It is chiefly as a result of this effect on summer production that the mean annual production is lower in the large flocks. The excess of relative variability of egg production of the larger flocks (100 and 150 birds) over the smaller (50 and 100 birds) observed in the annual records is found upon analysis to be on the whole fairly evenly distributed over the whole year. In the period of the year in which there is the heaviest production, such environmental differences as are implied in the different flock sizes in the experiment do not appreciably affect the relative variability of production.

HOW AN EGG IS MADE.

In connection with other studies on egg production an investigation has been made regarding the physiology of the process. The question here proposed is as to how an egg is manufacted in the body of a hen. During the past year a paper has been published from the Department dealing with the formation of the albumen or white of the egg. The chief results were as follows.

The Physiology of the Oviduct or Egg Tube.

After entering the infundibulum or mouth of the egg tube the yolk remains in the so-called albumen or white secreting portion of the oviduct about three hours and in this time acquires only about 40 to 50 per cent by weight of its total

albumen and not all of it as has hitherto been supposed. During its sojourn in the albumen portion of the duct the chalazae and chalaziferous layer, the dense albumen layer, and (if such a layer exists as a distinct entity, about which there is some doubt) the inner fluid of albumen, are manufactured and put upon the egg.

Upon entering the isthmus or membrane secreting part of the egg tube, in passing through which portion of the duct something under an hour's time is occupied instead of three hours as has been previously maintained, the egg receives its shell membranes by a process of discrete deposition. At the same time, and during the sojourn of the egg in the uterus or shell forming part of the egg tube, it receives its outer layer or fluid or thin albumen which is by weight 50 to 60 per cent of the total albumen.

This thin albumen is taken in by osmosis through the shell membranes already formed. When it enters the egg in this way it is much more fluid than the thin albumen of the laid egg. The fluid albumen added in this way dissolves some of the denser albumen already present, and so brings about the dilution of the latter in some degree. At the same time, by this process of diffusion, the fluid layed is rendered more dense, coming finally to the consistency of the thin layer of the laid egg. The thin albumen *layer,* however, does not owe its existence in any sense to this dilution factor, but to a definite secretion of a thin albumen by the glands of the isthmus and uterus. The addition of albumen to the egg is completed only after it has been in the uterus from five to seven hours. Before the acquisition of albumen by the egg is completed a fairly considerably amount of shell substance has been deposited on the shell membranes. For the completion of the shell and the laying of the egg from twelve to sixteen, or exceptionally even more, hours are required.

POULTRY MANAGEMENT.

At all times efforts are being made to improve the methods of management of poultry on the station plant. During the past year a new form of brooder has been described with directions for its construction in Station Bulletin 193.

Methods of Poultry Feeding Now in Use at the Maine Station.

The methods of feeding the flock of Barred Plymouth Rocks at the Maine Agricultural Experiment Station were considerably modified some years ago.

The methods now in use are as follows:

1. *Rations for Laying Pullets.*

Dry grain (fed in litter).

Early morning feed—cracked corn.

10.30 A. M. feed—equal parts wheat and oats.

These grains are fed each time at about the rate of two quarts to each 50 birds.

Dry Mash.

First month in laying house.

Wheat bran	300 lbs.
Corn meal	100 "
Daisy flour*	100 "
Meat scrap	100 "

Second month in laying house.

Wheat bran	200 lbs.
Corn meal	100 "
Daisy flour*	100 "
Gluten feed	100 "
Meat scrap	100 "

Third month in 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 laying house.

The mash has the same composition as that of the second month given above.

Fifth month in laying house.

The mash has the same composition as that of the third month as 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 of the type which has been described in previous publications from this Station.

Green food.

Either green sprouted oats, cabbages, mangolds, green corn fodder (cut fine), or a mixture of these.

* Or other low grade flour.

II. *Rations for Yearling Hens and Cocks Kept Over as Breeders at all other Times than During the Breeding Season.*

Dry grains.

The same as the pullet rations, except that if there is a tendency exhibited to fatten no corn is fed.

Dry mash.

Wheat bran	400 lbs.
Corn meal	50 "
Daisy flour *	50 "
Meat scrap	100 "

Green food.

Same as in pullet ration.

III. *Rations During the Breeding Season for All Birds Used as Breeders.*

Dry grains.

Same as pullet ration.

Dry mash.

Wheat bran	200 lbs.
Corn meal	100 "
Daisy flour *	100 "
Gluten feed	100 "

Green food.

Same as in pullet ration, except that green sprouted oats are *always* used, either alone or in combination with other green food.

IV. *Rations for Chickens.*

Chick Feed.

	Parts by weight.
Cracked wheat	15
Pinhead oats (granulated oat meal)	10
Fine screened cracked corn	15
Fine cracked peas	3
Broken rice	2
Chick grit	5
Fine charcoal (chick size)	2

Mash. (Used till chicks are about 3 weeks old.)

	Parts by weight.
Wheat bran	4
Corn meal	3 1-2
Linseed meal	1-2
Screened beef scrap	2
Alfalfa meal	1

This mixture is scalded and then dry rolled oats are mixed with it in the proportion of 2 parts rolled oats to 6 parts of mixture. The reason for mixing in this way is that it has been

* Or other low grade flour.

found by experience that if rolled oats are mixed with the other materials of the mash before scalding there is a tendency for the mash to be soggy after it is wet. Mixing in the way here outlined has been found to improve the mash greatly.

Dry Mash. (Used from 3 weeks to 6 or 8 weeks.)

	Part by weight.
Wheat bran	2
Corn meal	3
Linseed meal	1-2
Daisy flour*	1
Beef scrap	1

From this time on the composition of the mash is varied to suit the needs of the birds, as indicated by their stage of development.

Green Food.

For chicks up to 3 weeks of age—the tops of green sprouted oats, chopped fine.

From 3 weeks on—rape, or clover, or corn fodder cut as fine as necessary with fodder cutter.

WORK WITH PLANTS.

Beans.

During the year experiments were begun looking to the improvement of the old fashioned yellow-eyed bean. If this bean could be bred so to be disease-resistant and at the same time improved in yield, it would be one of the most valuable crops which could be grown in Maine. The old fashioned yellow-eye is one of the best, if not the best, baking beans known. The demand for it in Eastern markets always exceeds the supply.

At Highmoor in 1911 nearly 200 pedigree lines of these beans were grown. They are now being studied in the laboratory. A number of very promising lines have been found, and will be propagated on a larger scale next year.

Variety Tests of Oats.

In 1911 the oat variety tests were continued at Highmoor. It was a very unfavorable season and the yields fell off considerably from the year before.

* Or other low grade flour.

The yields in 1911 are shown in the following table.

OAT VARIETY TEST.

1911.

Name of Variety.	Yield in Bushels Per Acre.
Imported Scotch	62.4
Irish Victor	55.6
Clydesdale	55.0
Victor	54.5
Silver Mine	54.0
Prosperity	52.8
Kherson	50.0
President	49.5
Kherson	47.8
Lincoln	47.7
Danish Island	47.5
Banner	45.8
Regenerated Swedish Select	43.6
Regenerated Swedish Select	40.9
Early Champion	39.1
Senator	38.3
Regenerated Swedish Select	36.7
Average	48.3

The breeding work with oats has consisted of the study of individual pedigree strains to find what are most promising. Several strains which appear to be very valuable will be propagated on an extensive scale in 1912.

Corn.

Work with sweet corn and with field corn (yellow dent) is being continued. The field corn of the Cornforth strain, which won the bushel shelling contest at the Portland Corn and Fruit Show, has been now bred up to the point where it appears to be a highly desirable sort for the Maine farmer.

Entomology.

Since the entomological work began at this Station in 1888, a very considerable mass of important results has been ac-

quired concerning the insects of Maine. During the first eleven years the late Professor F. L. Harvey recorded orchard and garden pests which are still valuable for reference. His special studies of the Two-spotted Mite, the Currant and Gooseberry Fly, a Garden Smynthurid, Injurious Millipedes, an Injurious Caddice-fly, and the Carrot Rust Fly are among those contributions that contain new observations of real importance. Most significant, however, is his monograph on the Apple Maggot which remains the classic work on this insect, no one having since been able to do more than verify the facts of this excellent piece of work.

Under the supervision of Dr. Gilman A. Drew who was connected with the Station from 1900-1903 three bulletins of true scientific merit were issued;—two on The Grass Thrips and Plant House Aleyrodes by Lewis R. Cary and one on The Chinch Bug in Maine by H. W. Britcher.

The initial tour of investigation (1904-05) as to the extent of infestation of the Browntail moth in Maine and beginning of the campaign of instruction against this pest was undertaken by the Station through the sanction and aid of the State Commissioner of Agriculture.

The official connection of Miss Patch with the Station dates from July 1904 at which time the Department of Entomology was organized, which five years later was reinforced by Dr. Johannsen. Aside from several hundred more or less brief records of important insects of Maine (contained in annual bulletins called "Insect Notes") the recent insect work of the Station comprises special field, insectary and laboratory studies some of which might be mentioned in particular. The serious though local need of help against the Cottony Grass Scale was met by a field study which resulted in the effectual remedy given in bulletin on that meadow pest (1905). The rather sensational outbreak of the Strawberry Crown Girdler (1905) led to a study of the beetle in Maine and the publication of a bulletin upon it. An account of the Potato Plant Louse (1906) was the outcome of a season's field work in Aroostook County. A bulletin on The Saddled Prominent Caterpillar (1908) is a record of a phenomenal attack on Maine trees by a usually insignificant insect.

A number of years study of the aphids or plant lice of Maine by Miss Patch and upon Diptera by Dr. Johannsen has resulted in an accumulation of data some of which have been published in Buls. 172, 173, 180, 181, 182, 196, and in other papers; but much of which still remains to be worked up for the State.

The present work of the department of Entomology may be classified as follows:

I. Investigations of insects affecting special plants. (a) Injurious to fruit and fruit trees; (b) affecting corn, potatoes and garden crops; (c) injurious to forest and shade trees.

II. Studies on special groups of insects. (d) Beneficial parasitic insects; (e) plant lice and jumping plant lice; (f) fungus gnats, and life history studies of various other species of flies, particularly those of economic importance.

I. INSECTS AFFECTING SPECIAL PLANTS OR CROPS.

Among the insects injurious to fruit and fruit trees which have been noted this year the more important are the apple maggot, tent caterpillar, the apple leaf Bucculatrix, the plum curculio, the San Jose Scale, the plum Eulecanium, the cigar case bearer, the bud moth, the red hump caterpillar, and the brown-tail moth.

The apple maggot or railroad worm has claimed especial attention because of its relation to one of the most important industries of Maine. A closely related insect injuring fruit in Europe and South Africa has been successfully fought by means of a sweetened poisoned bait. The announcement of this discovery has led several entomologists in this country to experiment along these lines upon the fly whose larva causes so much damage to our apple crop. While, as yet, no definite directions for this method of control can be recommended for Maine, continued experiments may yield a hopeful outlook along this line.

The need of combating the brown-tail moth in Maine continues. A remarkable circumstance in the development of the insect this season should be recorded. The caterpillars have not previously been recorded in this State as feeding to a very troublesome extent in the fall and they have been apparently uniform in hibernating early in the third instar when about

1-4 inch in length. In the fall of 1911, however, in many localities they entered the fourth instar and were feeding freely enough upon the trees to be troublesome at apple picking and to destroy the foliage to a considerable extent. This circumstance is doubtless to be accounted for by unusual weather conditions. Whether the winter mortality will be greater for those caterpillars hibernating in the more advanced stage remains to be seen. It is encouraging to note that brown-tail moth parasites imported by the federal authorities and hibernated in Massachusetts are gradually spreading, some having been found in this State the past year.

Of the pests affecting grain, root, and garden crops this year, wire worms, bean maggots, beet leaf miners and potato and pea plant lice have been studied.

In the spring of 1911 a two acre plot was planted in sweet corn at Highmoor Farm, Monmouth, Maine. Owing to the great number of wire worms present, many seeds were so badly eaten that they failed to germinate and therefore a very poor stand was obtained. This circumstance gave an excellent opportunity to experiment with poisoned grains, coating the seed corn with arsenate of lead or paris green, and to try out various repellents such as lime, tar, tobacco dust, etc., all of which proved impractical in the control of these insects. The most encouraging feature in these experiments was the successful growth of Canada field peas upon an infested plot. This leads one to believe that a rotation involving peas, or possibly peas and oats may be effectively employed, though whether the wire worms are thereby actually reduced in number so that they may be less injurious upon susceptible crops planted later, future experiments alone will decide. Work along this line is planned for next year. A fuller account of these tests is published in Bulletin 195, Me. Agr. Exp. Sta.

The gypsy moth, the brown-tail moth, the spruce bud moth, the birch-leaf Bucculatrix, the larch saw fly and a native elm leaf beetle have attracted most attention as pests of forest and shade trees the past season.

A native flea beetle (*Haltica carinata*) attacks the American elm extensively in certain localities in Maine, the injury to the leaves presenting identically the appearance of that caused by the imported elm-leaf beetle so destructive in southern New

England and elsewhere. This insect is about equally well characterized as a burnished copper in color with dark blue reflections or as a dark metallic blue with coppery red reflections. Since its work on our elms has placed it among the economic species of the State, the station entomologists have had it under observation as to its life history and habits. Late in June the beetles deposit their yellow eggs in rows along the midrib and other veins of the elm leaves. During June the adult beetles feed upon the elm leaves but the chief damage is done by the young which hatch from the eggs and feed greedily until later in July when they descend to the ground for pupation. This pest can be combated by the same remedies that are applied in the case of the imported elm leaf beetle.

The spruce bud moth occurred in alarming numbers in the State this year. Reports were received early in July from a number of localities. An interesting feature of this invasion is the presence of several species of parasites.

Among the beneficial insects which are being investigated are parasites of the red hump caterpillar, of the spruce bud moth, of the beet leaf miner, and particularly of the brown-tail moth. The presence of a hyperparasite upon the parasites of red hump caterpillar is noteworthy.

II. STUDIES ON SPECIAL GROUPS OF INSECTS.

Of plant lice those affecting peas, potatoes, the maple and the alder have been given special attention.

Several years special study of the plant louse found in the white woolly-looking masses on the stems of alder very common in this State has enabled the station entomologists to ascertain the previously unsuspected fact that this species is the same that attacks the leaves of the native and ornamental maples, rendering them unsightly objects, during seasons of abundance. The winged females migrate from the alder to the maple in the fall and the eggs of the species winter over in crevices of the maple bark.

The economic aspect of this species varies with the locality. In Maine the alder along the rivers and streams is not valued and the insects infesting this growth are not significant so far as the alder itself is concerned. However, as the cultivated

cut-leaved maple as well as the native variety of the same species is in Maine dependent for its infestation on the fall migrants from the alder, treasured ornamental maples could be protected by destroying the alder in the vicinity. The practibility of this course would depend on the quantity of the neighboring alders. Where this could not be done the landscape gardener would save himself trouble if he withheld susceptible maples from the vicinity of native alders.

Considerable detailed study has been given a large green plant-louse commonly abundant upon the potato in Maine and a similar species very destructive to the pea. The distinctive structural characters have been carefully worked out so that these two species can be distinguished in all their forms regardless of the plant on which they feed. Certain important additions have been made to the list of native food plants which have a bearing on the economic status of these insects.

So little attention has been previously paid the psyllids or "jumping plant lice" in New England that the station entomologists have felt the need of working with certain species present in Maine. Among those of economic importance might be mentioned an amber yellow and green species injurious to birch leaves in spring, a dark winged species present on shade bushes, a conspicuously marked species on blackberry and a pear tree psyllid which renders the leaves discolored and sticky. These insects are a little larger than plant lice, which they resemble in their feeding habits as they pierce the tissue in the same way and suck their juices. Like plant lice, too, the psyllids secrete a sweet sticky fluid which daubs the surface of the leaves.

Of the habits and early stages of many species of flies little or nothing is known. This order of insects which was until recently nearly ignored by economic entomologists has of late sprung into prominence by reason of the direct relationship which some of the species, notably flies and mosquitoes, bear to diseases of man. Other species, the apple maggot, the beet leaf miner, the bean and the seed corn maggot among them, are serious crop pests. This has led the station entomologists to devote some time to the investigation of the early stages of these insects. Among them are the fungus gnats, whose

larvæ feed on mushrooms and other fungi, on seed corn, potatoes, etc. The work on this last group is now practically concluded and the results of the investigation appear in bulletins published by the Station. Work upon the early stages of various groups of flies is now in progress.

In conclusion we may say that while the prime duty of the staff of this department is that of investigating entomological problems under the provisions of the Adams Act of the federal government, its members are ever ready to determine insects sent in by farmers, gardeners, and fruit growers, and to suggest remedies for the control of pests. They are further always glad to receive information from anyone concerning insect ravages in any part of the State, either of new records or of unusual and unprecedented outbreaks. Bulletins and circulars dealing with the more important insects of Maine may be obtained free of charge by applying to the Director of the Experiment Station, Orono, Me.

Orchard Investigations.

The necessity and value of experimental work in horticulture was recognized by this Station from its inception, although no special department was established at that time. Such lines of horticultural work consistent with the station resources were started at an early date. References to experiments, conducted chiefly by the botanist and entomologist in orchard fertilization and spraying for control of parasites, as well as variety tests of tree fruits, bush fruits and grapes, are to be found in the Annual Reports of the Station from 1888 to 1891.

ORCHARD STUDIES BEFORE 1909.

In 1899 appeared the first bulletin devoted specifically to the orchard and its problems, and from this date the experimental work was mainly devoted to pomology. The several bulletins of the department from that time until Dr. Munson's resignation dealt chiefly with the problems in apple production. Reports of these experiments, conducted for the most part in the orchards of Mr. Charles S. Pope, of Manchester, were published at intervals under the titles "Orchard Notes" or "Ex-

periments in Orchard Culture." During the period referred to the study of Russian varieties of apples and their adaptability to Northern Maine conditions, as well as a study of seedling apples of Maine origin also received attention.

The unusually severe winter of 1906-1907, which was so destructive to apple trees in the southern counties of the State, inflicted such severe and permanent injury to the orchard where the Station was conducting its experiments that their continuation was impracticable. This fact, coupled with the resignation of Dr. Munson in 1907, put an end, temporarily, to pomological investigations.

Dr. Munson's last bulletin issued by this Station* was a summary of the results obtained in the orchard management experiments. Under that general head had been conducted the following investigations:

The effect of culture and fertilization vs. mulch without cultivation.

The effects of different potash salts upon the functions of the tree.

The effect of fertilizers of high nitrogen content.

The comparative effect of organic manure and chemical fertilizers.

Spraying for the control of insect and fungous parasites.

Orchard renovation.

The results of the work are here summarized by quotation from the bulletin.

"The work in this orchard has clearly shown that it is wholly practicable to take an old, unprofitable, rapidly degenerating apple orchard and, in spite of three unusually severe winters, at close intervals, (1) to bring that orchard into a profitable bearing condition; (2) to force Baldwin trees, by proper feeding, to produce fruit every year, instead of on alternate years; (3) to produce profitable crops of fruit by the aid of "chemicals" only, in connection with intelligent culture, pruning and spraying. It has further been shown, (4) that upon the particular soil involved, all expenditures for fertilizers, unless these fertilizers contain some nitrogen, is an absolute waste of

* Munson, W. M. "Orchard Notes, 1907." Bul. 155, Me. Agr. Exp. Sta.

money; (5) that, apparently, the excessive use of nitrogen, in the absence of potash or phosphoric acid, or both, is distinctly injurious to the fruit; and (6) as a corollary to the other points, that the best results are obtained from a complete, well balanced fertilizer rather than from an excessive use of any one element."

THE INVESTIGATIONS AT HIGHMOOR FARM.

As previously stated, investigations in pomology were temporarily discontinued at this time. The reasons therefor and the conditions under which it was expected that such work would be renewed, were outlined by the Station Director in the 24th Annual Report* and need not be considered here.

With the acquisition of Highmoor Farm came the opportunity for continuing pomological investigations under conditions necessary for the successful issue of experiments extending over long indefinite periods. Mr. W. W. Bonns was appointed associate horticulturist and began work in September, 1909.

BETTER ORCHARD MANAGEMENT NEEDED.

The conditions of the orchards at Highmoor Farm presented excellent opportunities for the working out of certain problems in apple production and for the stimulation of the fruit growers of the State to the adoption of improved orchard management methods.

That such methods have not been generally in vogue; that intelligent care and consideration in the growing of apple trees and their fruits have not in the past characterized the work of Maine orchardists as a body, are mild statements of the fact. Portions of the State are, with a sound basis of truth, credited with being "natural" apple sections. Nevertheless, the Maine apple crop as a whole has never been regarded by its producers as a product that makes serious demands upon their time or money.

Doubtless this is due to the fact that for many years natural conditions, such as the absence of orchard pests, were favorable,

---

* Woods, Chas. D., "The Maine Station and Pomology," Me. Agr. Exp. Sta., Annual Rpt., 1908, pp. 154-156.

and economic conditions resulted in good market prices. Now the conditions are different. Enemies of the orchard in the form of plant and insect parasites abound. These shorten the life of the trees and impair or nullify the value of the fruit for market. Furthermore, the increased plantings in the states of the Pacific Northwest, as well as in other apple sections, together with the highly developed commercial organizations for grading and marketing the crop, have resulted in the invasion of the eastern markets to New England's great disadvantage.

It is a delusion to regard the attractive exhibits at pomological meetings and fairs as indicating that Maine apple growers as a whole are producing and selling fruit equal to their western competitors. For every man exhibiting fruit properly grown, cared for and packed there are hundreds whose only activity in the orchard begins at harvest time. At present the chief value of such exhibits lies in the possibilities they suggest, both as to the opportunities of the industry in the State, and the results of applied intelligence.

It is equally idle to point out the superiority of Maine fruit in point of dessert quality. Apples, to the average buyer, are what they appear to be. Maine apples must equal rival fruit in every feature possible before they can command rival prices. Even the reputation for quality, once it be established, will count for little unless the fruit itself advertises it. In short, the problem of establishing and maintaining a high grade market for Maine apples means the growing of high grade fruit. For this it is necessary that methods widely known and long approved and practised in other states be here employed. The task of spreading these methods by precept and example rests with the agents of agricultural education. The function of the Experiment Station, as frequently emphasized, is to occupy itself with the principles underlying such methods; to conduct experiments, the results of which may be translated into terms of practice.

THE PROBLEMS TO BE STUDIED.

Such experimental work is in progress at Highmoor Farm. The Station has now the facilities for conducting investigations which in their nature must extend over an indefinite time

in order that the conclusions made will have a proper foundation. For certain kinds of experimental work with perennial plants, such as fruit trees, this long period for the accumulation of data is a requisite. The results of a single season may always be affected by natural factors beyond the control of man; hence the real conclusions must be based, broadly speaking, on the averages of the seasons. In this point orchard experimentation differs from work with an annual plant, where the life of the latter ceases with its single harvest. It must therefore be expected that the future publications of the Station on orchard experiments will for some time consist, in most cases, of seasonal reports of results and not the final conclusions of the work.

Aside from problems of the nature just described there is the work of orchard renovation. This has an importance wholly aside from its value as a piece of demonstration work. The first step to be taken in the rejuvenation and development of the Maine apple industry is the renovation of the existing orchards; naturally, the first point to be established is the degree of neglect which an orchard can endure and still be profitably restored and maintained for commercial ends.

For determining this, as well as for more scientific ends, the orchards at Highmoor Farm were well adapted when the Station assumed control.

CONDITION OF THE ORCHARDS IN 1909.

The varieties were Baldwin and Ben Davis with a scattering of other standard sorts, planted 25x25 ft. apart. The orchards had originally comprised about 5000 trees, but the persistent neglect to which they had been subjected by former owners, aided by natural enemies, had reduced the number to about 3200. These trees had stood in sod for an unknown time,—some of them apparently from the day of planting. Insects injurious to trees and fruits abounded, as did also various forms of parasitic fungi. The trunks and limbs were encrusted with lichens. Field mice by girdling or partially girdling the trunks had wrought serious damage. In addition, several severe fires had run through the orchard grass in recent years.

Irrespective of injury from these sources the unhealthy condition of all the trees was strikingly evident by the pale scanty foliage, lack of wood growth and unthrifty color of the bark. Standing for years in sod, the moisture and plant food necessary for their normal growth had been withheld. Such growth as had occurred had been undirected and the tops were a mass of ingrowing, entangled limbs which shut out sunlight, reduced aeration and invited decay.

Under such conditions, the failure to bear crops of any considerable size, much less to yield an amount commensurate with the number of trees, is not surprising. The Station has no records indicating the production of the Highmoor orchards from the time they reached bearing age until it came into control. By persons employed at harvest time by preceding owners the largest crop is estimated to have been between 600 and 700 barrels; this included fruit of all grades and in all conditions. In the majority of seasons the crop was hundreds of barrels below the figures just given.

By the time the Station acquired possession in 1909 the season was so far advanced that little treatment was possible. The orchards received their initial pruning in the fall and a general survey of all the trees was made, which indicated that about 36 per cent were in markedly poor condition.

Despite the fact that all of the several orchards needed thorough treatment, they were not all in equally poor condition. Their disposition for experimental purposes was therefore made accordingly.

The Baldwin orchard, being in the very poorest, if not in an apparently hopeless condition, was reserved in the spring of 1910 for a systematic renovation experiment. Another orchard consisting of several varieties, also in notably bad shape, was given thorough treatment before definitely deciding upon its fate; it has since proved sufficiently unresponsive to treatment to warrant its partial removal.

The largest block of Ben Davis trees, comprising about 18 acres, was set aside for the purpose of bringing it into a condition suitable for experimental work in the shortest possible time. Pending that date, (which at the time of writing has practically been reached), no specific experiments have been undertaken.

EXPERIMENTS IN BEN DAVIS ORCHARD NO. 2.

One large block of Ben Davis covering about 8 acres, although in need of thorough stimulation, gave promise of a moderate yield per tree in 1910 and was in a sufficiently thrifty and uniform condition for the inauguration of definite experimental work. It was therefore divided into plots for the following experiments:

1. (Comprising 2 acres). A study of lime-sulphur sprays.
   - A. With regard to their fungicidal efficiency as substitutes for bordeaux mixture.
   - B. Their effect on foliage and fruit in respect to injury.
   - C. The insecticidal effectiveness of lead arsenate in combination with them.
   - D. The relation of possible injury to leaf and fruit by such combination.
2. (Comprising 2 1-2 acres). A comparison of organic fertilizer in the form of stable manure vs. a complete chemical fertilizer.
3. (Comprising 2 2-3 acres). A comparison of clean cultivation vs. pasturage with sheep and with hogs.
4. (Comprising 2-3 acre). A comparison of cultivation with the sod mulch method.

The 1910 results of the experiment with spray materials have been reported in Bulletin 189 of this Station, entitled "Orchard Spraying Experiments." Seasonal conditions of that year were unusual, and resulted in injury to fruit in nearly all sections of the country, regardless of treatment. The results of the year, therefore, were viewed with this fact in mind. Such results were, nevertheless, very favorable to lime-sulphur solutions, commercial or home made, as substitutes for bordeaux mixture. Arsenate of lead was found to lose none of its efficiency when combined with the lime-sulphur preparations, and such slight injury as may be ascribed to chemical re-actions between them was insignificant. The only case of extreme injury resulted from the use of lead arsenate with a proprietary spray advertised as a "soluble sulphur" preparation. The latter is not recommended for use.

The spraying experiments, with modifications based on the results of 1910, have been continued during the season just

closed, and the results will soon be published as a station bulletin. In addition to the work along this line at Highmoor, co-operative work of similar nature has been carried on in three orchards at Greene, with satisfactory results.

The several experiments in orchard management indicated above have not been in operation for a time sufficient to warrant any conclusions, although such striking evidence of the effect of animal pasturage under existing conditions has been given that the latter experiment may be hereafter modified or discontinued.

INVESTIGATIONS BEGUN IN 1911.

The past season has also witnessed the beginning of the following new lines of work.

1. A comparison of a fertilizer excessively high in nitrogen, somewhat comparable to the Fisher formula, with a well balanced chemical ration. For this the Baldwin orchard is being utilized as well as a row of 35 trees included in no other work.

2. Apple breeding, in collaboration with the department of Biology. The object of this experiment is two-fold—to attempt the improvement of Maine's commercial varieties and to accumulate data bearing on the problems of heredity. The work of 1911 resulted in fruits obtained by hand pollination and in seedlings grown from seed planted in the spring. The study of seedlings and of crosses of standard varieties is being extended.

3. A fundamental inquiry into the relation of stock and cion has its preliminaries in a nursery of about 3000 French Crab seedlings, planted in the spring of 1911. Of these about 1000 root grafts on Tolman Sweet cions were made, thus supplying a Tolman Sweet trunk for future comparison with other stocks. As these young trees develop selections will be made from them and a new experimental orchard definitely devoted to the stock and cion work will be set out.

RESULTS OF RENOVATION METHODS EMPLOYED.

It is advisable to here again emphasize the fact that these experiments as well as those in orchard management are not

affairs of a season. They may, and doubtless will, afford results but slowly, and these may bear such relation to future evidence that the immediate publication of them will be inadvisable from the scientific standpoint. The satisfactory issue and value of such work depends upon the patient accumulation of data through many years, irrespective of the popular demand for early practicable and applicable results.

Regarding the Highmoor orchards as a general object of interest to the fruit growers of the State, the progress made from 1909 to the fall of 1911 cannot fail to appeal. The condition of the trees in the earlier year has already been outlined. The work of bringing them into thrifty vigorous condition has embraced nothing but such operations as are possible to every owner of an orchard, large or small. Judicious use of fertilizers; a system of pruning adapted to the condition of the trees; timely and thorough application of fungicides and insecticides; borer hunting; good and regular cultivation throughout the season up to the end of July, when a cover crop of winter vetch or rye has been sown, to be plowed under the following spring,— these are the practices that have resulted in a response one year earlier than had been expected. All the orchards, if we except those omitted by experiment from cultivation, have shown a marked renewal of vigor. The wood growth of the season left nothing to be desired; the foliage was dark green and luxuriant, free from fungi and practically so from insects. The Baldwin trees in the renovation experiment were especially noteworthy for their exceptionally green and dense foliage. They bore little fruit this year, but this was not to be expected, considering their condition of but two years previous.

A concrete illustration of the change effected in two seasons is the size and condition of the crop.

In 1909, before any treatment could affect it, the crop consisted of 90 barrels of marketable fruit obtained from all the trees on the farm.

In 1910 the chief effect of one year's renovation showed itself in the improvement of tree growth, rather than fruit production. Nevertheless the crop was increased to 275 barrels of a good grade of apples.

The crop of 1911 consisted of 2450 barrels, of which 2006 barrels contained no fruit smaller than 2 1-4 inches, of magnificent color, great size and free from worm holes or fungous spots of any kind. This means that practically all were either Fancy or Number 1 grade.

Another striking comparison is that of the proportion of marketable and cider apples. In 1911, with a crop of quality suitable for market in barrels to the number of almost 2500, the cull or cider apples were about 1-3 the number of those produced in the year that yielded but 90 barrels of marketable fruit.

Plant Pathology.

A large amount of loss is caused each year in Maine by plant diseases. Realizing the importance to the farmers of the State of preventing this loss, the Station has given more or less attention to plant disease work ever since it was established. Within the last 15 years the amount of this work has been greatly increased. This Station was the first in this country to show that spraying potatoes on a large scale with bordeaux mixture is both practicable and profitable.

With the establishment of a separate department of plant pathology 6 years ago it has been possible to do more work in the investigation of plant diseases. A study of the causes of disease is important in any case because in the end the prevention must be based upon a knowledge of the cause. This department is equipped for the investigation of diseases of all economic plants of the State but the work has been largely confined to apple and potato diseases on account of the importance of these crops.

POTATO SCAB.

Potato scab is a disease which causes a great deal of loss each year. The damage done by the fungus which causes this disease cannot be measured by the loss to the crop of a single year because the organism is able to live over in the soil and continue the disease year after year. Much care should be taken to keep this fungus out of land which is known to be clean. Land becomes infected, for the most part, in two ways,

through scabby seed and through manure which contains living spores of the scab fungus.

On account of the importance of this disease it has been made one of the chief lines of investigation. Methods have been perfected for the disinfection of seed so that land which is free from scab may not become contaminated by the use of seed carrying the fungus. Experiments are under way which are intended to throw light on the question of the length of time the scab fungus, under different systems of soil management, will persist in the soil thus causing the production of a scabby crop even though clean, disinfected seed is planted. Soil which produced a very scabby crop from clean seed in 1909 has been secured and is being kept under control conditions to determine how long the organism will live when no plants are allowed to grow and in other cases when certain plants which are not known to serve as hosts for this fungus are grown. This is a question which it will probably require many years to answer as it is well known that scab frequently causes great damage to crops from clean seed on land which has not grown potatoes for long periods of time.

Uncooked, scabby potatoes are frequently fed to farm animals. Work is being done in order to determine the extent to which the manure of different kinds of farm animals carries living material of the fungus when fed in this way. So far this work has been confined to experiments with the horse and cow.

BLACKLEG DISEASE OF THE POTATO.

The blackleg disease of the potato has become of great importance in Maine. The amount of actual loss in the crop caused by this disease is not so great as that caused by some others in this State but when Maine potatoes are shipped South for seed, blackleg does much more damage in that section. Therefore, it has become necessary, if Maine is to retain the southern seed trade, that the potato growers should know and apply methods for the elimination of this disease.

Field and laboratory studies upon this disease and upon the organism causing it have been under way for about 5 years. The results of the past season's experiments give every reason

to believe that any farmer in Maine can eradicate blackleg from his fields by careful selection of sound seed potatoes for one or two years and their disinfection with formaldehyde. Publications of the Station have described the appearance of potatoes affected with blackleg and have given in detail the methods for its control.

OTHER DISEASES OF THE POTATO.

Owing to the great losses caused by late blight and the subsequent rot of the tubers in certain seasons, some attention is given each year to the spraying methods which are being used by the farmers. Experiments by the Station have shown that the disease can be prevented by timely and thorough application of properly made bordeaux mixture. It has also been found that none of the dry fungicides which have been recommended as substitutes for bordeaux control the disease. The importance of a knowledge of the organism which causes the late blight, and of the thorough treatment necessary to its control, cannot be over emphasized. Poor methods of spraying are responsible for the greater part of the loss caused by the late blight fungus, despite the fact that it has been shown repeatedly that the disease can be controlled in seasons when the weather conditions are most favorable to the growth and spread of the fungus.

Besides these chief lines of investigation, considerable attention has been given to the factors concerned in the failure of seed potatoes to germinate in certain seasons. This is an important problem and can only be solved by the accumulation of a large amount of data in regard to the conditions under which such failures occur. Certain definite conclusions have been reached which will soon be published.

APPLE DISEASES.

Apple diseases cause a large amount of loss in Maine each year. This loss is not confined to the damage which may be done to the fruit of a single year because there are certain diseases which attack the wood and eventually cause the death of the tree. The only apple disease which had received much attention in this State up to 5 years ago was apple scab.

This disease was given attention before that time, first by the botanist and later by the horticulturist of the Station. In this early work the disease was described and the results of spraying experiments were given.

Since that time the methods of controlling apple scab have received attention from time to time. On account of the injury to foliage and fruit of certain varieties caused by bordeaux mixture the pathologist began experiments in 1908 in the use of lime-sulphur as a substitute for bordeaux mixture in the control of this disease. This line of work was given over to the horticulturist after 2 years comparison of self-boiled lime-sulphur with bordeaux mixture.

In the summer of 1908 work was begun in the accumulation of data in regard to the occurrence and importance of the fungous diseases of the apple in Maine. Material of diseased leaves, wood and fruit was collected from a large number of widely separated places and the fungi isolated from this material have been studied in order to determine the extent to which they are causes of disease. This has necessitated a large amount of culture work and extensive inoculation experiments.

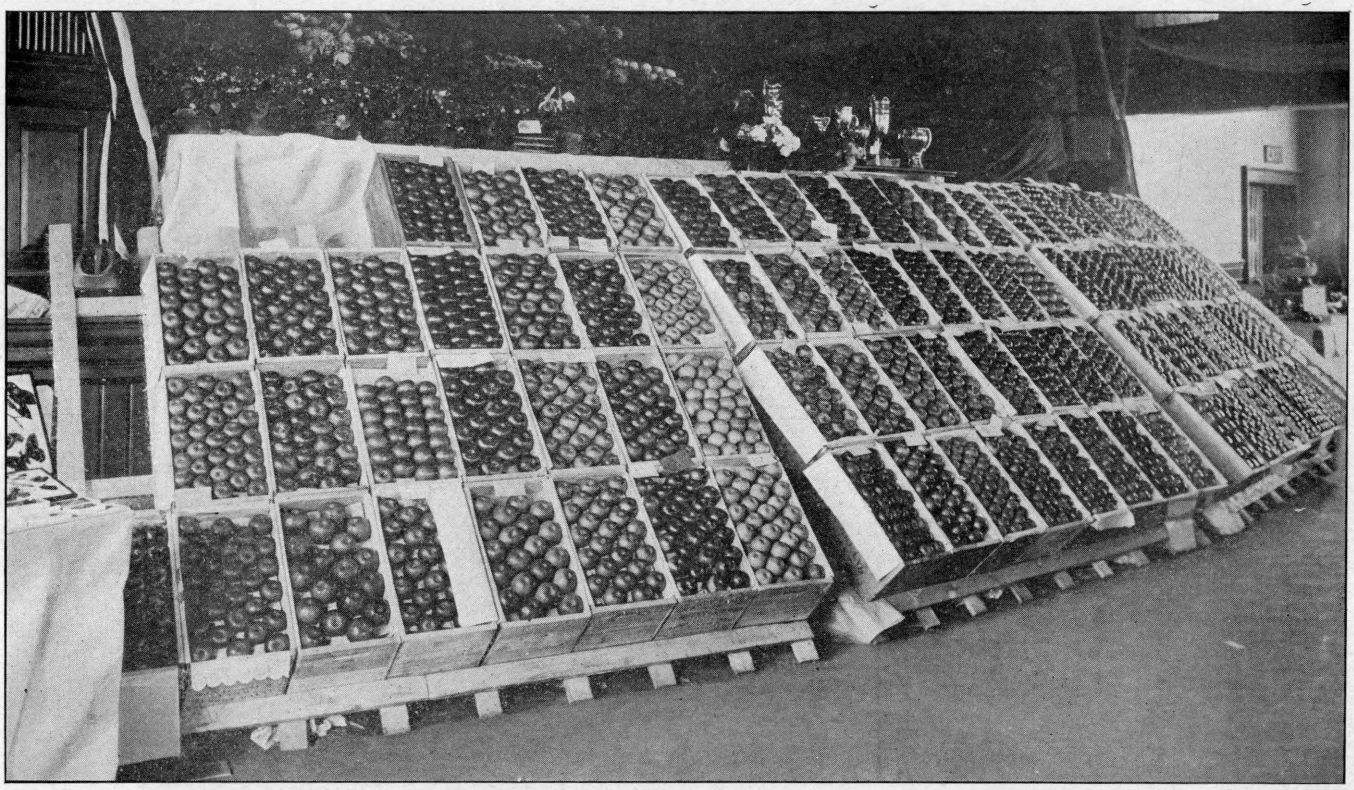
The leaf-spot of the apple is a disease which is very common in neglected orchards in Maine. This disease causes considerable loss as the leaves which contain areas of dead tissue cannot perform their functions. A large number of fungi have been found associated with leaf-spot in Maine. Inoculation experiments with material of the different fungi from pure cultures showed that only one causes the disease. This fungus also causes a decay of the fruit and canker of the branches of the tree. It is only by knowing that this fungus causes these different diseases that methods of control can be worked out.

As a result of the studies of apple diseases a bulletin has been prepared which treats in a comprehensive manner of the occurrence and methods of treatment of the various important apple diseases of Maine, other than those caused by insects. The descriptions and illustrations of the different diseases should enable the fruit grower to recognize them when they occur in his orchard.

Some of the fungi which are encountered in this work are either undescribed or have not been described as causes of

disease in plants. It is important that such fungi shall be studied sufficiently so that their characteristics may be determined not only for the immediate practical value that such knowledge may have but because this work helps to build up the science upon which the practical phases of much of plant pathology are based. For this reason, considerable attention has been given to technical studies of certain fungi associated with diseases of the apple. Part of these results have been published and work is now in progress on a group of fungi which cause disease not only in apples but in a number of other plants which are not at all closely related.

Each year a number of specimens of diseased plants are sent in to the pathology laboratory from different sections of the State. A record is kept of the occurrence of the disease and in most cases the specimen is preserved. In many cases photographs are taken showing the appearance of the affected plant. In addition to this, the pathologists are making observations as opportunity offers on the occurrence of diseases in the State other than those of the potato and the apple. Considerable data has already accumulated on diseases of other cultivated plants and it is expected that a bulletin will be prepared soon in which these will be described together with methods for their control.



Portion of Box Exhibit at Annual Meeting State Pomological Society, Augusta, November 14–16, 1911.

APPENDIX.

Annual Report of the State Pomological Society.

1911-12.

OFFICERS FOR 1911.

President.

DR. G. M. TWITCHELL, Auburn.

Vice Presidents.

H. L. KEYSER, Greene.
G. L. PALMER, South Livermore.

Secretary.

E. L. WHITE, Bowdoinham.

Treasurer.

E. L. LINCOLN, Wayne.

Executive Committee.

WILL E. LELAND, Sangerville.
F. H. MORSE, Waterford.
E. F. HITCHINGS, Orono.

Member of Experiment Station Council.

R. L. CUMMINGS, West Paris.

Trustees.

Androscoggin County—Silas A. Shaw, Auburn.
Aroostook County—Edward Tarr, Mapleton.
Cumberland County—John W. True, New Gloucester.
Franklin County—E. E. Hardy, Farmington, R. F. D.
Hancock County—William H. Miller, Bar Harbor.
Kennebec County—E. A. Lapham, Pittston.
Knox County—Alonzo Butler, Union.
Lincoln County—H. J. A. Simmons, Waldoboro.
Oxford County—W. H. Allen, Buckfield.
Penobscot County—A. A. Eastman, Dexter.
Piscataquis County—C. C. Dunham, Foxcroft.
Sagadahoc County—J. H. King, Bowdoinham.
Somerset County—Frank E. Nowell, Fairfield.
Waldo County—Vacant.
York County—J. Merrill Lord, Kezar Falls.

CONTENTS.

MEMBERS OF THE SOCIETY.

LIFE MEMBERS

Allen, Wm. H..... Buckfield
Andrews, A. Emery..... Gardiner
Andrews, Charles E..... Auburn
Atherton, Wm. P..... Hallowell
Atkins, Charles G.....Bucksport
Averill, David C..... Temple
Bailey, W. G.....Freeport
Bennoch, John E..... Orono
Bickford, Lewis I.....Dixmont Center
Bisbee, George E.....Auburn
Bisbee, Stanley.....Rumford Falls
Blanchard, Mrs. E. M.....Lewiston
Blossom, O. E.....Turner Center
Boardman, Samuel L.....Bangor
Briggs, John .....Turner
Burleigh, Miss Clara M..... Vassalboro
Burr, John ..... Freeport
Butler, Alonzo..... Union
Butnam, J. W..... Readfield
Chadbourne, C. L.....North Bridgton
Chandler, Mrs. Lucy A.....Freeport
Chase, Henry M., 103 Federal St..Portland
Chase, Homer N..... Auburn
Clement & Taylor.....Winthrop
Conant, W. H.....Buckfield
Conant, W. G..... Hebron
Corbett, Herman..... Farmington
Craig, William..... Abbottsford, Que.
Crowell, Mrs. Ella H..... Skowhegan
Crowell, John H..... Farmington
Cushman, Chas. L.....Auburn
Dana, Woodbury S.....Portland
Dawes, S. H..... Harrison
DeCoster, Virgil P..... Buckfield
Denison, Mrs. Cora M.....Harrison
DeRocher, Peter .....Bradentown, Fla.
Dirwanger, Joseph A.....Portland
Dunham, W. W.....North Paris
Dyer, Milton ..... Cape Elizabeth
Emerson, Charles L.....South Turner
Farnsworth, B. B..... Portland
Felch, Chas. E..... Limerick
Frost, Oscar F..... Monmouth
Gardiner, Robert H.....Gardiner
George, C. H.....Hebron
Gilbert, Z. A..... North Greene
Goddard, Lewis C..... Woodfords
Grover, Franklin D.....Bean
Gulley, Alfred G..... Storrs, Conn.
Hackett, E. C.....West Gloucester
Hall, Mrs. H. A.....Brewer
Hanscom, John .....Saco
Hardy, E. E..... Farmington
Harris, William M..... Auburn
Heald, U. H..... Paris
Herrick, A. A..... Norway
Hixon, A. A..... Worcester, Mass.
Hoyt, Mrs. Francis.....Winthrop
Jackson, F. A.....Winthrop
Keene, Charles S.....Turner
Keyser, Howard L..... Greene
Knowlton, D. H..... Farmington
Lapham, E. A..... Pittston
Leland, Will E..... East Sangerville
Lincoln, E. L.....Wayne
Litchfield, J. H..... Auburn
Litchfield, Mrs. L. K.....Lewiston
Littlefield, Harry W..... Brooks
Lombard, Thurston M..... Auburn
Lord, J. Merrill.....Kezar Falls
Luce, Willis A.....Columbia Falls
Macaulay, T. B..... Montreal, Can.
Mayo, E. P..... Waterville
McAllister, Zaccheus ..... West Lovell
McCabe, George L..... North Bangor
McLaughlin, Henry..... Bangor
McManus, John ..... Brunswick
Merrill, Oliver F.....Gardiner
Mitchell, Frederick H.....Turner
Mitchell & Co..... Waterville
Moody, Charles H..... Turner
Moore, William G..... Monmouth
Moor, F. A..... Waterville
Morse, F. H..... Waterford
Morse, W. J..... Orono
Moulton, Dr. John F..... Limington
Newell, G. E..... Turner
Page, F. W.....Augusta
Palmer, George L.....South Livermore
Parsons, Howard G..... Turner Center
Patten, Mrs. E. C..... Topsham
Prince, Edward M.....West Farmington
Pope, Charles S..... Manchester
Pulsifer, D. W..... Poland
Purington, E. F..... Farmington
Richards, John T.....Gardiner

LIFE MEMBERS—Concluded.

Ricker, A. S.....Turner
Ricker, Fred P.....Turner
Roak, George M.....Auburn
Sanborn, Miss G. P..... Augusta
Sawyer, Andrew S..... Cape Elizabeth
Saunders, Ernest..... Lewiston
Seavey, Mrs. G. M.....Auburn
Simmons, H. J. A.....Waldoboro
Skillings, C. W.....North Auburn
Smith, Frederick O.....New Vineyard
Smith, Henry S.....Monmouth
Snow, Mary S..... Bangor
Stanley, H. O..... Winthrop
Staples, Geo. W., 904 Main St., Hartford, Conn.
Starrett, L. F..... Warren
Stetson, Henry..... Auburn
Stilphen, Asbury C.....Gardiner
Supt. Maine Sanatorium Farm.....Hebron
Taylor, Miss L. L. (Lakeside)....Belgrade
Thomas, William W.....Portland
Thomas, D. S..... North Auburn
Thurston, Edwin..... West Farmington
Tilton, William S..... Boston, Mass.
Townsend, Mrs. B. T..... Freeport
True, Davis P..... Leeds Center
True, John W.....New Gloucester
Twitchell, Geo. M..... Auburn
Vickery, James..... Portland
Vickery, John..... Auburn
Wade, Patrick.....Portland
Walker, Charles S.....Peru
Walker, Elmer V.....Oxford
Waterman, Willard H..... East Auburn
Waugh, F. A.....Amherst, Mass.
Weston, Joseph..... Gardiner
Wheeler, Charles E.....Chesterville
White, Charles M..... Bowdoinham
White, Mrs. Annie.....Bowdoinham
White, Edward L.....Bowdoinham
Woods, Chas. D..... Orono
Wright, Frederick..... Bath
Yeaton, Samuel F.....West Farmington

ANNUAL MEMBERS FOR 1911.

Bass, Lizzie E..... Wilton
Bass, Mary A..... Wilton
Bicknell, C. S.....So. Weymouth, Mass.
Bonns, Prof. W. W..... Monmouth
Bowers, Dr. J. W., 732 Congress St., Portland
Brock, Dr. H. A.....Portland
Bryant, J. B..... Buckfield
Burleigh, Mrs. H. C.....Vassalboro
Carll, E. C..... Augusta
Conant, A. A..... Hebron
Conant, Elsie A.....Hebron
Conant, E. E..... Buckfield
Conant, H. L..... Hebron
DeCoster, Mrs. V. P.....Buckfield
Dolloff, E. W..... Standish
Eastman, E. A..... Dexter
Flint, John M.....E. Baldwin
Freeman, Geo. H.....Wayne
Gardner, A. K..... Augusta
Hardy, W. M..... Brewer
Harris, M. H..... Greene
Harvey, Geo. L..... No. Anson
Hayes, William..... Gardiner
Heath, Gardner K..... Readfield
Jewett, P. E..... Alna
Johannsen, O. A..Experiment Sta., Orono
Jones, Geo. T..... Fairfield Center
Jones, L. R..... Wayne
Jones, O. K..... Sabattus
Knowlton, Geo. H.....Vassalboro
Leavitt, L. C..... Kezar Falls
Lee, Lyman K..... Foxcroft
Littlefield, J. R..... Brooks
Macomber, E. W..... Winthrop
Millspaugh, Mrs. L. H..... Winthrop
Nichols, Dr. Estes..... Hebron
Patten, R. G..... Skowhegan
Pierce, Franklin..... Hebron
Perley, C. A..... Winthrop
Prescott, F..... Carmel
Reed, R. C.....Temple
Rines, J. Henry.....Portland
Rogers, Frederick P..... Carmel
Rogers, Mrs. Jeanette S...No. Newburgh
Smith, Geo. S.....Monmouth
Sparrow, Geo. E..... Gardiner
Sturtevant, Ernest F..... Auburn
Tarr, Edith A.....Mapleton
Tucker, Benj..... Norway
Washburn, C. C..... Mechanic Falls
Winslow, E. B.....Portland
Yeaton, Geo. A..... Augusta

ANNUAL MEETING
OF
MAINE STATE POMOLOGICAL SOCIETY,

AUGUSTA, MAINE, NOV. 14, 15 AND 16, 1911.

TUESDAY EVENING, NOVEMBER 14.

Music.

Prayer by Rev. L. W. Coons, of Augusta.

Music.

In the absence of the Mayor, Hon. Niles L. Perkins gave the address of welcome on behalf of the city.

Members of the Maine State Pomological Society, ladies and gentlemen:

I deem it a great honor and special privilege tonight to be granted the opportunity to welcome, in behalf of the Mayor, the Maine State Pomological Society to this capital city. Knowing what you stand for and realizing what you have accomplished, I wish to extend to you a hearty greeting and cordial welcome on the part of every citizen within our borders. It has always been the custom of Augusta to throw open its gates and give enthusiastic support and co-operation to every and any society or body that comes into our midst with the object of advancing and developing the resources of Maine. You have gathered here tonight, as I understand it, for that very purpose,—to discuss different experiments which you have tried since your last meeting, to initiate new ones, and thereby develop and make more productive the fruit growing industry, which is one of incalculable value and far reaching importance to the welfare and prosperity of our State.

Any one who knows anything about the teaching of this industry fully understands the obstacles which it has had to surmount. I have been in the forestry business three years in this city; I have done work in and traveled over the greater por-

tion of southern Maine; I have spent hours and days trying to get people to spray their trees, to do pruning and take better care of their orchards, and I fully realize how hard it is to get people to do anything along this line. Although this Society has been working in the State for a great many years and putting in hard work, nevertheless you can go into many parts of Maine today and see old orchards which, if the trees were properly sprayed, the dead limbs pruned, the cavities cared for, and the ground fertilized, could be made to yield many times more in quantity and fruit of much better quality. In the West, especially along the Pacific coast, where I was a few years ago, I found that they took the very best care of their fruit trees. They kept them under the highest cultivation and as a consequence made them yield the maximum in quality and quantity. There is only one thing for us to do, and that is what this Society is doing,—to go out amongst the people, make our beautiful displays of fruit, as you see here this evening, that are obtained under scientific treatment, build up a permanent school of instruction, and bring home to the individual by actual practical tests the fact that they must do these things in order to accomplish the best results. We cannot stand still. We must either progress or go backwards.

You could have selected no better city than Augusta in which to hold this meeting. She, today, is the convention city of the State. There is every reason why she should lead the other cities in this respect. She is centrally located. She has ample accommodations to provide for the welfare and comfort of all comers. When a few years ago she found that her accommodations were inadequate for all who wished to come, the citizens put their shoulders to the wheel, got down into their pockets and the present Augusta House is the result. There wasn't a citizen who ventured in that movement who expected to get the full return on his money. It was purely and simply a public spirited movement. Recently the Maine Teachers' Association met here, numbering some 2,700. I think it was one of the greatest conventions that was ever held among the teachers. They were highly pleased with the reception and care they received while in the city and agreed to come and see us again. And that is the way we are going to make you feel before you go away. Our homes are all open to you, to stay as long as you will.

There is one thing that you can always count on the Augusta citizens to do, and that is to lend personal aid and assistance to anything which has for its object the welfare and prosperity of this grand old State. Too often we come to these meetings, listen to what is said, and then go away without putting any further thought upon it. But tonight let us make a resolve that we will in the future boost this industry and carry what we learn into every nook and corner of Maine. There is one thing that we have got to do in this State, both young and old, and that is to boost Maine. You cannot boost Maine too much. She has the soil, she has the climate, she has the men and she has the brains. The Southerners are continually boosting the South. The people of the West will make you think that if you invest a little money there you can grow almost anything on the desert. I am a great believer in advertising our State.

In closing, I wish to state again that Augusta gives you a cordial welcome and that it is the earnest hope of every citizen that your stay here may be so pleasant and instructive that you will be glad to come and see us again.

ADDRESS OF WELCOME.

By Hon. E. C. Carll, President Board of Trade.

I am glad that I have the opportunity to express the pleasure of the Augusta Board of Trade in having this organization here. And I cannot help feeling that the pleasure is mutual. I believe you are glad to come because you share in a general feeling that exists throughout the State of Maine that Augusta is a good place to come to,—a general liking of the city of Augusta which is doing much to make it the great convention city of the State of Maine.

The interests of agriculture, commerce and the industries are mutual. Farm prosperity makes an ever increasing contribution to commerce. Not only do the city men realize more fully than ever how much of their prosperity is based on a prosperous agriculture, but there has developed a widespread ambition among them to do some of the farming themselves. Farming is becoming the style. As an old Granger, I found the recent

meeting of the State Board of Trade much like a Pomona Grange meeting. The president reminded them, even the second time, that they were supposed to pay some attention to the subject of new industries, but they kept right on talking about fertilizers and crops just like any other set of farmers. And when interested, these keen business men are no mean students of the problems of agriculture. The recent great Corn and Fruit Show in the city of Portland showed not only an interest in the subject in the general promotion of business, but an intense interest among business men in the occupation itself, in making up the large list of special prizes contributed practically by members of our Board of Trade. We found in working for these prizes so many men who seemed to have a great interest in farming that getting the prizes was one of the easiest things you ever saw.

You have met to promote a great branch of agriculture. Your exhibition will stimulate interest and your program, with addresses by specialists, will lead to better and more profitable methods. I hope you will also induce those who know how to do things to branch out and extend their operations in order to break away from the 7 x 9 efforts. All branches of farming should have the Aroostook spirit, throughout the State. When the Aroostook man got the right method he gave up the idea of a potato patch and planted a field. Years ago a prominent man in one of Maine's cotton mills when a new building was finished, said: "This corporation has laid its last brick. We have room enough." But that corporation has been laying bricks ever since and is still at it. Expansion is as necessary to the growth of business as to the growth of trees. I wish that the broad gauge view of extensive operations by right methods might spread all over Maine, whether in orcharding or whatever crops may be grown to the best advantage.

When I was a boy I remember seeing some men tear down an old house, to erect another on the spot. The house was old, weather-beaten and delapidated. It seemed to me as though its building must have been way back in the early settlement of the town. But an old man took me to a near-by pasture on the same farm and pointed out a grass-grown hollow surrounded by apple trees, and said that was where the pioneer's dwelling stood, and that the house I then saw demolished was the second that had been worn out on that farm. Last year I visited that

spot and there I saw one apple tree loaded with beautiful fruit, one of the many instances illustrating the old age and hardiness of that fruit of our Maine soil. I tried to picture in my mind the planting of that tree by the pioneer; his interest, before the days of grafting and budding, in the first fruits of the tree, and his pleasure in finding it of pleasant flavor and a good keeper. I imagined the children of that old time home bringing those apples up from the cellar and eating them before the broad hearthstone, while their great fires up the chimney roared. And still the old tree flourished while their children and their children's children lived and passed away; and no man in that town today can tell the name of those settlers or point to you their last resting place, while that tree stands, hardy, vigorous, productive, typical of the stock that settled these Maine farms, its May time bloom and the blushing fruit illustrating the girls of Maine as they then were and as they now are. There is no fruit like the apple. Let us thank the Giver of all good and perfect gifts that it finds its most congenial environment upon these grand old hills of the State of Maine.

RESPONSE.

By PRESIDENT G. M. TWITCHELL.

In behalf of the Maine State Pomological Society I wish to express our obligations to you for the cordial invitation and the hearty assistance rendered in perfecting the plans for this gathering. It is a double pleasure to me, standing in this position, for I am coming back home where I have spent twenty years in work upon these streets and among some of you who are now residents and active in the work here. To come back here among the old associates and greet them and be greeted, as I have been in the past few days, is, I assure you, a pleasure which will be remembered long after I have returned to my present home. It is a pleasure to me to stand here to express our obligations because I appreciate what Augusta has been doing in the years for itself in the improvements which have come upon your streets and business places, in the enterprise which has been manifested all along your lines, knowing that what tends to the improvement of any town or city in the State

tends to the benefit of the State as a whole. So what we have been doing in our little work, or in our greater work upon the hills and down the valleys of Maine, has been tending to the good of the State of Maine as well.

It was not necessary that you should express your appreciation of our coming, it was not necessary that you should speak the word of welcome,—you gave utterance to it in a very forcible manner in the magnificent list of special prizes which you offered to be distributed here among the fruit growers of the State, showing your desire to help in a substantial manner, in strengthening the desire for the growing of better fruit, for the more thorough cultivation of our orchards, for the building up of an industry which in the years may become of transcendent importance to this good old State of Maine. We are all linked together. Whether we work upon the paved street, or out upon the gravelly hills,—wherever we toil we are all working for one end and for one purpose, the building of a better standard of manhood and womanhood and the carrying forward of the industrial progress of the good old State of Maine.

So, speaking for the State, for its orchard industry, let me direct your attention for a moment to one or two little facts. Maine has been peculiarly blessed this year. Of all the states of the Union Maine ranks highest in the percentage of farm crops. This is something we want to remember, friends, because it speaks not only of a blessing which has been bestowed upon us, but it speaks also of the industry and thrift and energy and skill and patient toil of the men and women upon the farms and in the towns of the State. If I had time I would like to speak of our varied industries, and I want just for a moment to speak of this industry and its value, because I know that the business men of the State have little knowledge, real knowledge, of what it is and of what it is doing. We have not come here, my friends, in answer to your invitation, that we might exhibit the fruit alone, we have not come here that we might listen to or participate in the discussions of the varied questions,—we have come that we might call, if possible, the men and women of the cities and the towns, who are not the producers of food, into our gatherings, and that they might see something of what the men are doing out upon the farms, that they might come to realize that the struggle there is for improvement, that the effort there is for the building up of a better standard of quality

of all the products of the farm; that you might come to feel, ladies and gentlemen of the city and town,—how dependent you are upon the man upon the hills, how necessary he is to your existence, and how there should be a closer bond of fellowship between all classes in the years to come for the building up of the State. This industry which we are seeking to promote means much to the man of the town as well as to the man of the farm, an industry which in the State of Maine this year will equal fully one and one-half million barrels of apples, yet we have not reached a full crop. It is only in sections of our State that our crop approaches its full capacity. So that we are capable easily of growing more than two million barrels of good fruit, such fruit as you see here upon these tables.

I have in mind a little orchard of five acres set in 1888,—200 trees, of which there are now living about 135 to 140 trees, some good, some bad and some indifferent, and yet the owner of this orchard for the past nine years has taken out of it an average of 268 barrels of apples which have sold upon an average for better than $3 per barrel. This year the crop was 550 barrels, following a crop of 287 last year. You see as an investment, as a business proposition, it appeals to you. The most marked results attained in New England are reported by a gentleman in Massachusetts, who set an orchard of 5000 trees in 1904 and 1905 and this year has taken from those trees $10,000 worth of fruit. It seems almost beyond comprehension that these things can be, and yet they all attest what the men on the farm are seeking to do, and it seems to me must suggest to you the fact that they are working upon great problems as well as you in the towns and cities, and working, as I said before, for the good of the State of Maine.

This Society stands pledged first of all to the promotion of fruit growing, and the strengthening of the desire for the growing of better fruit, and the study of the questions of soil conditions; that we may select varieties which are best adapted to individual sections and localities, and the perfecting of fruit which shall do the most for the State. I believe it offers an inducement to men seeking an investment which cannot be duplicated anywhere else in this country. If the men of Maine, who have been sending their money to the far West, had but invested it upon the hills of Maine, during past years, their returns would have been far more secure and far more substan-

tial. If the banks of the State of Maine, instead of lending so large a percentage of their money upon western securities would lend more in the good old State of Maine, we should hear the hum of industry everywhere. So as we labor, let us remember that we are working together and that these things which we notice today and which call for correction are to be corrected only as men in the town and men in the country stand shoulder to shoulder to help solve the great problems which come into their hands, and doing that we will find that the Maine State Pomological Society, uniting with the boards of trade in towns and cities, will hold yearly larger and still larger exhibitions, will call together yearly larger and still larger numbers, will exert a wider and still wider influence, and in the years we will find that this fruit industry is becoming one of the great industrial works of the State and bringing satisfaction as well as comfort and substantial returns to every locality.

SOME LESSONS FROM 1911.

By GEORGE T. POWELL, President of the Agricultural Experts Association, New York.

Each year as it passes has its particular lessons which if they are learned should be a help in the coming years.

One of the chief obstacles to the more rapid progress of a large number of those engaged in farming is that of not studying the conditions of each year as they present themselves, and changing and modifying their practice to more efficiently meet the requirements of existing conditions.

DRY WINTER OF 1910-11.

The year just passing was preceded by an unusually dry winter. Very little rain fell in the autumn of 1910, and but little snow covered the ground in many sections through the winter, while there was a deficiency of rainfall through the spring and summer. There was an unusual loss of trees and shrubs in many places in New England and New York, the cause for which was attributed to the severe open winter.

EVERGREEN TREES INJURED.

Evergreens suffered most, and many of them came out in the spring with their foliage seared and brown and dead. It was generally accepted that the steady cold weather of the winter and the long period of freezing temperature had killed the evergreen trees and shrubs. Evaporation in the winter has been the cause of this. The fact is, it was not so much the freezing as the evaporation of the sap of the trees in the winter. Trees must have an abundant supply of moisture in the soil in the winter, for the process of evaporation of sap goes on in the winter the same as in the summer, though not to so great a degree.

When trees are in full foliage in June, with a steadily rising temperature, tons of water are daily taken up by them individually, and passed off into the atmosphere by evaporation and transpiration through the foliage.

In the winter when the foliage is absent the process of evaporation goes on steadily, and more rapidly when the temperature lowers and wind prevails.

It is at such times that the peach buds suffer and are often killed. The moisture is evaporated so rapidly that they are left for a time in a dry condition and it is then that the germ is killed. It is the dry condition that is produced, not the low temperature that kills the bud.

It is quite generally conceded that a temperature of sixteen to eighteen degrees below zero will kill peach buds, but such is not a fact.

PEACHES WITH LOW TEMPERATURE.

One of the largest and most valuable peach crops I have ever produced at "Orchard Farm" was that following a winter when twenty-six degrees below zero was recorded. Very few buds were killed and we had to thin off seventy per cent of the fruit to save the trees from breaking. We have never spent an hour of time propping trees, but rather we prune and thin heavily. These trees had produced a heavy crop the preceding year, which was one of normal rainfall. They made good growth of wood; the fruit buds were strong and well developed; the soil was well filled with water before winter, and

while there was not snow during the winter and low temperature prevailed frequently, the trees came out in the spring in good condition, the buds strong and able to give a full bloom, and set a large crop of fruit.

TILLAGE AND CROPS.

In most sections where peach orchards were given good summer culture in 1910, and the cultivation was kept up late, there were excellent and full crops of fruit the past season, but where cultivation of the soil was neglected the crop was a failure.

The season of 1911 will long be remembered for its unusual deficiency of rainfall. Many farmers had to draw water long distances for their stock during the winter months, while the hay crop was heavily reduced by the prolonged drought of the spring and summer.

One of the most valuable lessons that farmers and fruit growers should have learned from the year 1911 is that of the importance of the tillage of the soil.

At "Orchard Farm" with the exception of a few local showers that moistened the surface of the soil a few times, during seven months there was not sufficient rainfall to affect springs or streams; yet, we have never produced a larger crop of apples, or of better quality, and particularly of better size.

This sample of Rome Beauty apple (exhibited) was taken from a tree that produced one and one-half barrels of apples the seventh year from planting, the tree being a medium size of two years when planted. There were many McIntosh trees that produced the same quantity at the same age.

This orchard with others was given early and continued cultivation up to the middle of July. The indications seemed to be those of a continued dry period, and cultivation was then to be relied upon to conserve such moisture as was in the soil to keep up the growth of the trees and the maturing of a fall crop of fruit.

CLOVER AND BUCKWHEAT COVER CROPS.

For nearly twenty years it has been our practice to sow clover for a cover and green crop to be plowed in annually, but for two years the summers have been so dry at the time of

seeding, in July, that a light growth only of the clover has been obtained. The past season, to make more certain a larger humus crop, we sowed buckwheat over nearly one hundred acres of orchards. Much of it reached five to five and a half feet high, some of which was plowed in, in September, before the seed formed, but as large crops of fruit had to be handled, the balance was cut and left on the ground. This large growth together with the mass of roots in their decomposition will add much humus to the soil.

A NEW LESSON SUGGESTED.

We have long been an advocate of clean cultivation, allowing no sod about the trees. We also advocate low headed trees for the first six years of a young orchard. We are still in favor of that culture.

We are now going to adopt a different method after seven years of cultivation, which will be not to plow or cultivate nearer than seven feet from the trees, or such distance as will avoid crowding against the trees by the teams.

HIGHER COLOR DESIRED.

With continued cultivation and with the leguminous crops plowed in for several years, while good size in the fruit is obtained, it requires a longer time in which to have the high color so desirable brought out.

It is known that on the trees that stand in sod the apples are more highly colored, though they are smaller in size and yield.

Without doubt the grass takes up moisture and checks the development sooner, which brings out the color better and earlier.

If in the highly cultivated orchards the apples are left on the trees until all get good color, there will be a large loss from the dropping of the fruit and from storms that are liable to reduce the crop. The suggestion is sometimes made that the earlier maturing apples be picked, going over the trees two or three times. This is impracticable on any large scale. Very few men can be employed who will select the mature fruits. They will pick as many of the uncolored as colored apples, while they will knock off many more in moving and placing

ladders. This is practical only with dwarf trees, where it might be done to advantage.

THE ROOTS OF A TREE.

As trees grow older the roots next to their trunks perform a different function than while they are younger. They become the strong bracing parts of the tree, to hold it in place and to resist the winds, when the trees begin to take on heavy weight in the fruit they carry. Were it not for the strong large roots the trees would blow over during high winds, and especially when the soil is wet from heavy rains. There are very few fine or feeding roots on these enlarged portions for a few feet out from the trunks, the trees getting their main nourishment from the fine fibrous roots out at the extremities that push out and into the soil in all directions.

We are inclined to believe it will give better results to have the soil undisturbed next to the trunks of the trees; to keep such vegetation, mostly weeds, as may grow there cut to form an accumulating mulch. All stones should be closely picked up and a surface formed where the wind-fall apples may be saved in good condition to be sent to market where a cheaper grade of fruit is always wanted.

Where evaporators are at hand this dropped fruit would have higher value for drying. Cultivation would then be kept up in the center of the spaces between the trees to make readily available the plant food that is in the soil and to conserve soil moisture.

We believe that it may be possible through this change of culture to reduce the cost of production by thirty per cent and at the same time to obtain somewhat higher color in the fruit. Tillage should be carried only to the extent of obtaining a good annual growth of wood. As soon as this is assured tillage should cease, for size in the fruit will be obtained along with a good growth of wood, especially where green crops are regularly grown and plowed in.

FERTILIZERS FOR ORCHARDS.

The subject of fertilizer is one upon which it is very difficult to give advice or even an opinion. The secrets of the soil are many that have not yet been solved and are far from being understood.

This makes fruit culture one of the most interesting lines of work, for there is in it so much to be learned and known, and the longer one continues in the work the more he realizes there is to be discovered and worked out. At "Orchard Farm" we began tree planting on soil that for more than a century had been producing general farm crops, and naturally in that time its original supply of plant food should have been considerably reduced. This fact was discovered in the rather unsatisfactory quality of the fruit that was produced. The question arose, how to most economically bring up a higher productiveness.

For a time we put in sheep and steers and fed for the manure they would furnish, but as there were a hundred acres to be laid out for orchards, it was a slow process to try to produce enough manure to cover so much land.

Commercial fertilizers were attempted but that required more capital than was available to carry out that plan, and their value was not altogether certain on this soil, which is a glacial drift, gravel loam and limestone with more or less of variation over the farm.

It became evident that where stable manure was used more positive results were observed, but as this was not to be had in sufficient quantity, a system of clover culture was attempted for the purpose of plowing in to furnish what the manure added, the humus, which this soil had lost and which it was evident it needed more than anything else.

It was a struggle for several years to get a satisfactory growth of clover; in fact, for three years on the same soil it seemed more of a failure than anything that had been attempted, but there was some gain and the policy was pursued until a most marked improvement began to develop, when what seemed like a discouraging failure began to show promise of real success.

From the time that good stands of clover were obtained, marked improvement in the soil, in the growth of trees, and in the yield and quality of the fruit have been realized.

We have been carrying out some lines of work with commercial fertilizers to cover a period of seven years. Four years of the time have passed. We have used a complete fertilizer, feeling that in so long a period of the production of cereals there had been a depletion of the principal food elements in the soil.

On peach trees there has been a decided showing of results.

On apple trees the results have not been so marked. On a row of Rhode Island Greenings, in an orchard now seventy-five years old, the second year after applying 35 pounds of basic slag for phosphoric acid, 20 pounds of sulphate of potash, and 22 pounds of nitrate of soda per tree, the foliage was distinctly darker green in color than the rest of the orchard. The apples were also of a decided green in color, while on the other trees there was more of the yellow shade, near maturity. The size of the apples on the fertilized row was larger. For the past two years there have been prolonged droughts, with no perceptible difference noted.

In all of the orchards clover is being sown for a cover crop, and plowed in, excepting the past season, when buckwheat was substituted. The first six trees on the fertilized row of apples have made a large growth and have produced more apples than the unfertilized row next to it. Yet there are individual trees over the orchard that without fertilizers applied have made equal growth of wood, and have produced as many and as good apples.

SELECT GOOD SOIL FOR ORCHARDS.

Over much of New England, as in other sections, when orchards have been planted, too often land has been selected that was not the best for the farm crops. This has been, and is, a mistake.

The best soil should be selected for trees, for upon such, orchards will make more rapid growth. They may be made to produce profitable crops several years sooner, while the cost for fertilizers may be saved, if good tillage is kept up, combined with leguminous cover crops.

The value of the apple crop is so much greater than most farm crops, that it pays to give the orchards the best land on the farm.

SMALL ORCHARDS.

One of the most valuable lessons of the year 1911 is that of the small orchard well tilled. Such have produced in a season of unusual drought large yields of excellent fruit.

A well cultivated orchard of five acres for a majority of growers will produce more profit than larger orchards with

only ordinary care. If in sections where the conditions of soil and climate are favorable for orcharding, every farm should have a five acre orchard put out and given the care it requires, it would produce more income one year with another than the entire balance of the farm. This has been the secret of the success of the orchards of the Northwest. There a vast territory of land is covered with small orchards. Water has to be used in irrigating the land, and as this is expensive, the small acreage is enforced, but they have brought large returns from the high care and culture that have been required under the conditions. Thousands of acres of orchards may now be seen under intensive culture through portions of Oregon, Washington, Idaho and Colorado. Their fruit is being sent into our eastern markets in large quantities and unless we improve our eastern methods, the West will hold the best trade in our eastern markets.

The question is constantly being raised, with the very general interest that is awakened in apple growing,—Is there not danger from over production?

While this may be possible, it is not probable. The same question has been asked for the past half century, and apples are higher priced and much of the time so very high as to be prohibitory in common use.

THE PRESENT APPLE CROP.

The crop of the present year is estimated to be about 30,000,000 barrels, which is less than half of what it was in 1896, when 69,000,000 were produced in the United States and readily consumed. From that time to the present the annual production has ranged from 19,000,000 to 44,000,000 barrels, while the increase in population has greatly increased the demand for apples.

In 1909 Maine produced 950,000 barrels of apples, in 1910 900,000 barrels, while the 1911 crop is estimated to be 1,350,000 barrels.

The yields for all of New England for 1909 were 2,350,000 barrels. For 1910, 2,850,000 barrels, and for 1911, estimated 3,150,000 barrels. In New York, which is the leading apple producing state of our Union, the yield in 1909 was 4,100,000 barrels; in 1910, 3,600,000 barrels, and in 1911, 5,200,000

barrels. The total yield of the United States in 1909 was 25,415,000 barrels; in 1910, 24,225,000 barrels, and in 1911, 30,065,000 barrels.

These figures do not show an increase of apples that is anywhere near the increase in population.

The prices for apples for the past few years have been too high for their free consumption by the masses of consumers. The wholesale prices in Boston in the autumn of 1909 ranged from $3 to $6 per barrel; in 1910 from $4 to $6; and in 1911 from $2 to $4 per barrel.

The retail prices are much higher than the wholesale, and many consumers have had to turn to cheaper foreign fruits as they could not pay the high cost for apples.

At many of the retail stores good apples are sold for $1 to $1.50 a dozen, while at the hotels one baked apple costs twenty cents, which costs the consumer at the rate of $60 a barrel.

The retailers and the hotel proprietors claim that to get the fine quality of apples such as their best customers demand, they have to assort often from three barrels to obtain one bushel of really fine apples.

This is why the small orchard for most growers is more desirable, that they may give them better care and produce more of the higher quality that is demanded. For the past sixty days the markets in all of our cities have been over supplied with a large quantity of inferior apples—poor, wormy, undesirable fruit which in some instances has not brought the cost of freight and barrels, while strictly fine apples have been in demand at good prices, from $3 to $5 per barrel.

These are some of the lessons of the present year, and they are so full of instruction that if heeded they should be of value in the years that are to come, and if they are, the future will have good things in store for those fruit growers who continue to plant trees and properly care for them.

Portion of Plate Exhibit at Annual Meeting State Pomological Society, Augusta, November 14–16, 1911.

PRESIDENT'S ADDRESS.

Members of the Maine State Pomological Society and Friends:

It is fitting at the opening business session of this our forty-eighth annual gathering that we remember the faces of those formerly active but now absent. Whether they have passed on, or because of ill health or the infirmities of age are not able to join in these services for the promotion of pomology, they should, at this time, be recalled and their devotion to the best interests of the State stir every one to a deeper enthusiasm in preparing for the work of another year. One fact cannot be too strongly impressed, that, in spite of adverse conditions, in spite of drouth, extreme heat and early frosts, the record of 1911 places Maine at the head of all the states in percentage of yield of all crops adapted to this climate. Over and over again has this truth been demonstrated, still we are not yet alive to its significance. It is high time for a complete inventory of our industrial blessings. When that is taken, chief among them will be found the fruit possibilities of the State. It is criminal to paint unnatural pictures or hold out too highly colored inducements, but it surely is necessary that the actual facts be realized as they are not to-day, even by the most successful growers. There is a fruit belt in Maine, the outlines of which must be more distinctly marked. There are varieties best adapted to different localities and these should be determined for the greatest good of future growers. There are soil conditions most in harmony with the best development of specific varieties and these must be made more pronounced by actual tests that future orchards may be rightly planted. This problem of adaptability of soil to different varieties is one of the most perplexing problems facing the student, yet upon its solution will rest the future development of the industry.

There is a method of treatment, which has general application, and will insure health, vigor and highest productiveness to any orchard and this must be made plain. To my mind here is the specific work for this, the only organized fruit body of the State. The holding of annual sessions, the calling together of such grand exhibitions of fruit, not to be excelled on the globe, in quality, the organizing of a program like the one opening before us and the publishing of an annual report is, to-day, uot the complete work of a state pomological society.

Our mission cannot be realized until Maine apples stand for something, until we have established a standard in apple culture and are able to maintain it, until we can educate the coming man to grow the best fruit possible, where the choicest is certain to follow right cultural methods.

Before desired results can be obtained certain specific steps must be recognized and followed.

1st. Greater care is necessary in the selection of a site for an orchard. The complications forced by the multiplication of insect pests and diseases and the certainty of further increase necessitate the selection of orchard sites where sprayers can easily be operated, while the heavy loss in Maine during the past ten years by freezing makes prominent the subject of natural or acquired drainage to protect the trees.

2d. It is high time the door was permanently closed against the irresponsible tree agent, and every would-be purchaser urged to confine his orders to a few standard varieties and his trade to nursery men known to be reliable, whose written guarantee can be accepted as adequate protection. Too many orchards just coming into bearing, as well as those older, tell of rank injustice, or worse, on the part of agents or tree dealers. The sale of thousands of trees in Maine the past year, of a well known variety, long after the market was sold bare and a supply could not be obtained, is a form of tree business from which would-be fruit growers must be protected. Every buyer is entitled to a guarantee that every tree shipped is whole root budded or grafted and that the scions came from tested trees known to produce choice fruit and to have been persistent bearers. The element of chance must be eliminated to the farthest degree.

3d. Education is demanded as to what constitutes a good tree for setting, that buyers may discriminate and refuse to accept inferior stock, whether in size, shape, top or root.

4th. The very apparent lack of uniformity in methods of pruning both root and top before setting, suggests a possible series of public demonstrations of immense value, while the necessity for instruction in trimming young trees to insure shape of top desired is forced home upon every thinking orchardist, and must claim public attention.

These self-evident facts make obligatory extended work along educational lines,—work too long neglected and which can best be reached through a well directed campaign for improvement by this organized and state supported society.

The increase of insect pests preying upon tree and fruit, and of diseases threatening serious trouble, will necessitate more stringent measures for protection and more complete supervision by the State as well as far more thorough work by orchardists. The man who does not spray becomes a menace to all the neighborhood, and protection of the industry is paramount to individual fancies or practices. Maine orchardists received last year very close to four million dollars for their fruit, prices ruling abnormally high, yet because of rigidity of laws and practices covering grading, packing and branding in the far West, the growers there realized for the same amount practically twice as much.

The question of quality does not enter here to our injury, for the eastern apple is in every way superior when properly grown and graded. This tremendous loss, resulting from bad methods and lack of supervision, is our greatest drawback, yet all amendments to our fruit packing law, tending to insure a clean pack, true grade and honest brand, and to increase value and price of the Maine product, were defeated in the last legislature through the influence of a few orchardists.

In the second congressional district there are almost one hundred orchards of more than one thousand trees each, while in the third one could easily find as many more, with still others in York, Cumberland, Penobscot, Piscataquis and Hancock counties. In addition, are numberless smaller orchards on every hillside. This output of fruit must be radically increased as the one hundred thousand trees set in 1910, and as many

more in 1911, come into bearing. To-day every indication points to a still larger setting in 1912. All this makes imperative a campaign of education for legislation to protect Maine fruit.

The great majority of our apples are purchased on the trees, or at picking time, by representatives of foreign, or out-of-the-state, buyers, and sorted and packed according to market conditions, not according to law. The commercial standard rules and that fluctuates according to demand and supply. Meanwhile the State and the industry suffer in that these apples are all branded "Extra No. 1. Maine Baldwins" or "Spys," etc., the per cent of No. twos being ridiculously small. It was these apples I saw opened in western Massachusetts and Connecticut last winter, which brought only criticism and condemnation on the State as a whole and every grower therein. No friend of Maine's apple industry can rest until the brand on every package shipped or sold is true to the contents of the same. This much the consumer is entitled to; this the producer must have, to insure income from his orchards.

Individual interpretation of law must yield to standards fixed by state inspectors. The complete vindication of that friend of the common people, Dr. H. W. Wiley, who, as head of the National Pure Food department, has stood for pure food regardless of the most vindictive abuse and opposition, gives promise that under national rulings this practice of deception in packing and branding apple packages may be controlled by Government inspectors. When that day arrives excuses will have little weight and the plea of ignorance no relief.

In view of the defeat of our proposed amendments to the fruit law in the last legislature, allow me to submit the recommendations of 1910 and urge the more complete organization of this society that such as may be adopted, may be publicly discussed and interest centered on these features most important for the promotion of the industry, before the legislature of 1913 convenes.

1st. To provide for a system of inspection by state authorities of all boxes and barrels intended for sale.

2d. To remove the qualifying sections in our present law permitting imperfect and damaged specimens in classes 1. (*extras*) and 2 (*No. 1's*) so that every apple shall be as represented by the brand upon the outside of the package.

3d. To provide for adequate penalty and method of enforcement, in case of violations.

4th. That all agents or representatives of foreign, or out-of-the-state buyers, and all buyers and shippers in the State, be required to notify the Department of Agriculture of the date or dates and volume of proposed shipments and to whom consigned, that the volume of the crop raised may yearly be determined.

5th. That a committee be raised at this session to ascertain the cost of a colored lithographic barrel and box label, to include the seal of this society and allow necessary blank spaces, and report at the next annual meeting, the object being to provide the members of this society with a choice label for use in shipping, and the further advertising of the apples of Maine.

6th. That in view of the alarming decrease in the number of song birds and bees, and with a full recognition of their valuable and necessary services in fertilizing all blossoms, this society, through chosen representatives, attempt systematic experiments to determine the value of non-poisonous insecticides. So serious has become this loss and so tenaciously does the scientist cling to arsenical preparations and combinations that we may well institute careful experiments along other lines to determine, if possible, what agents are effective and not injurious to bees and birds.

To my mind the weakest spot in the whole fruit problem today is the method of disposal of the product. Here and there we find growers who have established a market but the great majority are at the mercy of commission dealers and shippers. So long as this continues, the grower is practically a cipher in disposing of his fruit, simply passing it on to others to accept what they are willing to give. The commission plan as operated by so many today has little to commend it to the grower, and those only with few barrels, and no acquaintance with the market, can longer afford to ship in this manner. The time has come when, for the protection and promotion of the industry, there should be in the State, central fruit growers' organizations, where paid officials shall receive, handle and dispose of the product, protecting from an overstocked market, shipping to most favorable centres, and insuring net returns not possible through individual efforts.

The manager of the California Fruit Distributors, very truthfully says: "Unless your fruit passes through one channel, which has all information in regard to shipments, amounts going into different markets, and the condition of these markets, you will never achieve success. As long as a number of different organizations are in the field working independently, you will always be working at cross purposes and the results are sure to be disastrous. Your own competition will kill the price of your products and this is entirely to your own disadvantage, with no corresponding advantage to the people who buy and handle your products, as owing to this competition there is always uncertainty in regard to cost of goods delivered; and each dealer is afraid that his competitor will be able to get the same goods for less money, and is, therefore, unwilling to take hold and push the business as it should be pushed."

A sarcastic old farmer once remarked that the reason farmers did not co-operate more was that there were too many of them who would rather lose a dollar than see another make two. It will be impossible for growers to realize in the greater distributing centres, as they otherwise might, until their representatives follow the crop to its final destination. The yearly loss to Maine orchardists resulting from lack of attention to just protection in disposal of their fruit reaches hundreds of thousands of dollars and will continue until practical co-operation becomes an actual fact.

The growing consciousness that by and through such organized bodies the future apple grower must unite to compete with the western growers, now so thoroughly organized, places this problem before this society as one of paramount importance. If the New England grower is conservative, and tenacious of what he terms individual rights, that conservatism must be disturbed; if he is, because of the experience of the past, suspicious of others, that suspicion must give way to confidence; if habit has established a method of disposal of his fruit product, that habit must be broken by the introduction of methods and practices now recognized as absolutely necessary in every other department of industrial life.

The individual unit must be lost in the chain of corporate power. One man can handle the product of a thousand orchards at less expense, and insure a better price, than one

thousand men contending with each other in the market. The sudden severe drop in price September 12 to 15 told simply of the indiscriminate crowding upon the market of stock, good, bad, and indifferent, by growers from every portion of New England. A well organized association would have divided and diverted shipments and prevented that glut so welcomed by the commission dealers at the great centres. It was not the result of a heavy crop but of bad business methods in handling. This must continue until growers are brought to see the importance of organizing for protection, and this campaign of education lies legitimately in the path of this State Pomological Society. Important as is the right setting and care of new orchards the burden of obligation is in line of protection of those now planted and the best possible disposal of the yearly product. Because of neglect of good orchard principles there is a tremendous loss to growers, not necessary, but resulting from causes which easily might be remedied. Too many take counsel of their fears rather than their judgment. Reports of the Department of Agriculture show that in the face of a rapidly increasing demand, owing to the growth in population, the annual production of apples in the United States actually decreased more than 138,000,000 bushels between 1896 and 1908, during which period our population increased fully 12,000,000. In 1895 the yield of apples in this country was 60,453,000 barrels and in 1910 only 24,000,000. In view of these facts the fear of over-production may well be discarded.

At the same time, because of the claims made by certain newspaper and magazine writers, it will be necessary to hold constantly before the public the fact that this is no get-rich-quick scheme. A positive and lasting injury is being inflicted on innocent parties as well as the industry, by these writers. Men are giving up occupations and homes, and with little means, and no experience, reaching out to buy an orchard, expecting to pick gold dollars from the branches without labor.

Over and over must the lesson be emphasized that the well cared for orchard will insure substantial returns and is today one of the sanest, safest, and most lucrative investments a man can make, but with this there must go in big type the fact that these returns come only to him who plants, fertilizes, cultivates, sprays, prunes and has constant supervision over each and every tree. Experience is demonstrating that the scope of this

society cannot be limited to the holding of an annual exhibition and one or two field day meetings. Receiving aid from the State it must serve the State in larger measure, as the relations between the grower and the land, and the grower and the market, become more complex.

With this thought I have attempted to indicate some of the specific lines of work, and surely some of the opportunities directly in our path. The supreme thought must be the greatest good of the industry and no step can justly be neglected which can foster and promote it.

The past few years have so jarred old-time standards that the entire system of conducting annual fruit exhibitions has changed. This society has entered a broader field where new features must constantly be added to meet new demands. The public awakening to the value of such an exhibition as now adorns this hall, manifested in the grand list of special prizes offered by the citizens of Augusta, and friends of the industry, must be accepted as indicative of a growing appreciation of the possibilities of fruit growing in Maine and the opportunity for this state society to constantly move forward in aggressive work for the greatest good of the entire State.

The complete success of the second New England Fruit Show at Boston insures regular annual or bi-annual sessions, and exhibitions affording an opportunity not to be obtained in any other manner for substantiating all claims for the superiority of the New England product. If Maine lost in state competition the causes are recognized and will not be met again.

Failure on the part of Maine growers to take advantage of and compete for the liberal prizes offered inevitably placed us at a disadvantage. More public spirit must be injected into the great body that the progressive policies adopted elsewhere may be made to enhance the value of the Maine apple.

What is possible with a live Board of Trade in advertising the industrial work of the State was clearly manifest last week in the complete success of the Corn and Fruit Show at Portland. That these exhibitions will multiply as years pass seems clearly indicated and it behooves the friend of the apple to be alive to each and every opportunity to set before the public the character and quality of the Maine product. Rightly organized, this branch of agricultural work may be radically increased in the next twenty years.

Two years ago at your urgent solicitation, and against my own best wishes, I accepted this honorable position and in accordance with my public declaration at that time shall turn the duties over to my successor at the close of these sessions. The complete harmony of purpose and loyalty of every officer and member have made possible the remarkable exhibitions held and the high character of every session. In this short period of time the scope of our annual exhibitions has been radically enlarged. I bespeak for my successor the same cordial, hearty support so fully accorded me, pledging my earnest co-operation in promoting whatever will best build up the fruit interest of this good old State. That interest is only in its infancy. Wisely fostered and carefully guarded and protected Maine can easily be placed first of all the eastern states in volume of production as it is today in the natural quality of its product. Our objective point must be a live, positive, aggressive fruit sentiment spreading yearly, insuring proper care of all orchards, better knowledge of the principles of cultivation and fertilization, complete protection from pests and diseases by spraying, a wise and effective law insuring a true pack, a clean grade, and honest brand upon every closed package and behind all this thoroughly organized local fruit shippers' associations to lift the burdens from the individual grower and insure fair returns for every package. Then, with ten million barrels yearly as our contribution to hungry consumers we shall, through united effort, make the fruit industry a constant mine of wealth and our praise will be in all the mouths of a grateful public.

"You can climb to the top of the loftiest hill
If you work;
You can make of yourself whatsoever you will
If you work:
A faith you must have rooted deep in your soul,
A purpose unshaken, a firm self-control,
Strive on without ceasing, you'll reach to the goal,
If you work."

OUR APPLE PACKAGE.

By A. K. GARDNER, State Horticulturist.

We are here at this meeting to devise different means of increasing our standards in fruit work and to demonstrate that we have profited by the lessons learned in past years. In some cases the results have not been as good as expected, but on the whole, we are advancing very rapidly and in the right direction.

Our fruit is more uniform, cleaner and better packed than at any previous meeting, and, while we must improve our methods still more, we have reason to be proud of this showing.

The different phases of orchard management have been discussed and rediscussed, with the result that there is a growing tendency in all sections to improve and better the handling and growing of fruit.

More growers each year are finding the advantages of clean culture in their orchards; in the increased vigor of the trees, and in the size, quality and amount of the crop. Most growers are practicing intelligent methods of pruning, taking out the superfluous branches and giving the fruit a chance to color thoroughly.

Spraying has become a necessity and more and better grade pumps are being installed each season, insuring more fruit free from worm-holes, stings and fungous growth.

In fact, all the branches of orchard management are receiving increased attention, with the result that our crop this year contained a larger percentage of choice fruit than in any past year.

Now comes the question of marketing. We have trouble each year in disposing of our fruit at even normal prices, because of the fact that dishonest methods have been indulged in too freely during the past few years. Poor grade apples have been mixed with the choice in order to dispose of them, and

they have constituted a large portion of the crop where spraying has not been practiced. Large and small fruit have been mixed indifferently throughout the barrel and grading has been an unknown quantity. In order to pack apples properly, whether in boxes or barrels, careful grading must be practiced. Not only does this mean that all the wormy, bruised and imperfect fruit must be culled out, but it also means that the perfect fruit must be graded, as to size and color, so that when the pack is completed the apples will be uniform throughout.

Often the grower says that his other work does not allow him time to be so fussy with his apples, or that he can get just as much for them from the buyer and doesn't have to worry over disposing of the culls. This may be partially true, but if a man is in the apple business to stay, he must establish a reputation for honest work; if he is not in to stay, the fruit business would be much better off without him. Successful fruit growing is not, and never can be, a side issue to some other branch, for it demands careful and constant study and intelligent application of principles.

In the West the Unions send out their own packers headed by a foreman whose duty it is to see that the fruit is properly graded as it comes to the packing table. No grower is permitted to pack his own fruit, and it is to this precaution that the high prices for western fruit are partially due.

In connection with grading, I think that all choice and fancy apples should be wiped before they are packed. Where the spray adheres to the fruit, it presents an unattractive appearance and cheapens it in the eye of the consumer. If the fruit is bright and attractive, more people are influenced to purchase, with the result that there is an increased consumption, and, consequently, an increased demand.

Demand is what we are looking for and we will never be able to increase that rapidly by putting poorly colored, poorly graded and poorly packed fruit on the market.

Although the barrel has been used exclusively in marketing our apples up to the last few years, yet now the box is becoming more and more popular for the fancy grades of some of our varieties. The success of the box for the western grower is clear, and it is because of this that growers are gradually giving up the idea that the barrel is the only feasible package.

Trials have been made in many cases and the conclusion reached that there is not enough real difference in the financial return to warrant the extra expense of material and packing. This may have been due to various causes:—

I. The boxed fruit may have been poorly graded, with too many inferior apples, and too many sizes of fruit used.

II. The apples may not have been wrapped.

III. The pack may have been such that the fruit did not reach the market in good condition.

IV. Inferior varieties may have been tried.

V. Large fruit may have been tried where the difference in price would necessarily be small.

First, let us take up the difference in cost of packing the box and the barrel.

Our barrel at the present time costs any where from 30c-45c, at an average cost, say of 35c. It will cost about 7c to pack the fruit and head it, making a cost of 42c per barrel, or 13c per bushel.

Our box costs from 11c-23c, but should average not over 15c in shooks; it costs 1c to make them up, 1c for paper and 5c to pack, making a total of 22c per box, or 66c per barrel of fruit.

Comparing the two, the cost of packing a barrel would be 42c as against 66c for a like amount in boxes, or a difference of 24c per 3 bushels fruit. In order to offset this difference, the box must realize 8c more per bushel.

Now what advantage has the box to offset this difference:—

I. The box demands better grading.

II. There is a demand for the smaller package in fancy grades.

III. The amount of fruit in the package is exact.

IV. There is less chance for spread of decay.

V. It reaches a more fancy market.

In box packing the grower has to handle each apple separately and even if some inferior fruit gets by in grading, he will be apt to discover it when placing it in the box. The eye will detect the fruit that is too green for uniformity of color and keep it separate for a different pack.

Different sized fruit is sure to spoil not only the appearance but also the stability of the pack. Green fruit should be placed in packages separate from the blushed, even though the

size and variety are the same. In competition for prizes at the fruit shows, there is nothing that will be scored harder than green fruit in the bottom of the box.

Again, to obtain a good pack with the right bulge, all the fruit in the box should be the same size. The impression that larger apples have to be put in the centre of the box is wrong, for if the right pack is selected the natural crowding in of the fruit to the centre will cause it to spring sufficiently for a medium bulge of 3-4 in. to either face.

When the consumer demands a fancy apple, the smaller package is desirable. It takes up a much smaller amount of space, is easier to handle and more attractive. In many cases the fruit is not consumed rapidly enough to prevent a part of a barrel from spoiling and there is less loss of fruit in the small package.

Again, when a box of fruit is purchased the exact number of apples is printed on the outside, so that the price of each apple can be readily estimated.

There is less chance for spread of decay if an apple is bruised during shipment, as the papers protect the remainder.

The box must be used for the fancy trade, where the fruit will return a good price. In this way the grower can build up a reputation with the consumer who is willing to pay for what he gets providing it is A No. 1. A few years ago apples at ten cents apiece were unheard of and no one would have been willing to pay such a price for a single fruit. Gradually, however, the standard has been raised and the consumer educated to the fancy stock. By making the fruit more attractive, the consumption has been increased, insuring a greater and more even demand, with the result that the price has doubled and trebled.

Now, let us return to some of the mistakes that have been made in trying out the box and barrel in practical tests. Take poorly graded fruit for example. Suppose we take a certain number of boxes—say fifteen—and barrels to correspond in quantity of fruit,—five. These apples are of the same grade and will sell for say 1c each at the retailers. If it is medium sized Baldwins, for instance, that will mean $1.00 to $1.25 per box for the retail price. When the middleman's profit and the

commission are taken out, the results are very unsatisfactory to the grower and the barrel is decidedly the better package.

Again, suppose the apples are of very fair quality, but are of various sizes, some selling at 1c and some at 5c. The grower will not realize much more than he would in the previous case on the box, and again the barrel is superior and more satisfactory, because of the smaller cost of handling.

But suppose the fruit has been carefully graded as to size and perfection, so that the price is 5c each to the consumer. Here the box is worth from $5-$6 and should net the grower at least $3 or $9 for three boxes Now, in some cases barrels net the grower as much as $9, but more often $4-$6 is nearer the mark.

When a grower puts such a grade on the market, he establishes a reputation for himself and in a few years can dispose of his fruit f. o. b. at a high figure. This may sound like theory and fairy tale and might end with the words, "And he lived happily ever after," but it has proven to be true in too many cases to deny.

Mr. Marshall of Fitchburg disposed of his crop of fancy McIntosh this year at $3.25 per box f. o. b., simply because his fruit was very carefully graded and packed. What he has done others can do and many in this State are doing the same thing. In this case the box is easily the better package.

All boxed fruit should be wrapped. The paper not only prevents the spread of decay, but also keeps the fruit from slipping and sliding during transportation, insuring a neater and more attractive appearance upon opening. When a man becomes familiar with wrapping, the box can be packed just as rapidly and often more so as there is less slipping after the tier is nearly completed, the paper holding the fruit firmly in place.

It is not the custom to wrap the barrel fruit in paper because of the great expense, consequently it will not reach the market in as good condition; this is especially true of such varieties as the McIntosh and Jonathan which bruise very easily.

That the poor condition of the fruit on arrival is due, partially at least, to the manner of packing was clearly seen at the Boston Fruit Show. Fruit of the same quality and size was received in both good and bad condition even when shipped by the same methods and equal distances. On inspecting the pack,

however, we would find that one man had used the right pack, the apples fitting closely; that the other had either used the wrong style of pack or had not used any care in packing, allowing the fruit room to move about and bruise. This was more often the case, too, when papers had not been used. After a little experience the grower can tell at a glance which style of pack to use and will know whether or not layer paper will be necessary in order to get the right height of ends.

The question came up as to whether or not all varieties are fit to pack in boxes. Personally, I do not favor the idea of trying to pack some of our inferior quality varieties in boxes. The Ben Davis, Gano, etc., seem to me better adapted to the barrel, especially since they suffer comparatively little harm from hard pressing, and are fit for long transportation.

While it is the general impression that only large fruit is produced in the West, I think you will find upon looking into the case, that it is the medium sized fruit that is being chiefly shipped. Apples that will pack less than 88 to the box are considered too large for commercial work and it is easy to see why. Suppose we pack apples that run 41 to the box. That means we will have to receive about ten cents retail apiece in order to realize as much as we would on apples half as large at five cents apiece. Now, the apples that are sold for ten cents apiece are limited in number and the demand for such fruit is not increasing very rapidly. On the other hand, if such fruit is sold at the rate of five cents each that means only $2.00 per box with the middleman's profit and the commission man's fee to be taken from that.

For this reason I believe that the extra large fruit must be shipped in barrels in order to realize the greatest possible returns. As it looks to me at the present time, the choice and fancy fruit that is not too large should be shipped in boxes; the poorer grades, inferior quality varieties and extra large fruit should continue to be shipped in barrels; and no matter what package is used we should grade each apple honestly and conscientiously.

MR. POWELL: I want to ask one question, in reference to wiping our eastern fruit. Of course that is the practice of the West, and the question occurs to me whether taking the fruit from our eastern orchards, it is going to be necessary to wipe

the fruit. Now many do admire, if it is possible to get it, the beautiful bloom on the fruit here at the East. At the West, of course, with the heavy spraying, much of the fruit has to be washed in order to get off the lime and hence wiping necessarily has to follow. But the question is this,—If we wipe the fruit does it have as good keeping quality? That is the point I would like to have brought out.

MR. GARDNER: Why, no, I don't think it does; but provided it has been properly sprayed during the season I don't see that the keeping quality would be very much affected. As we are situated here, with the brown-tail moth, it seems to me that the fruit should be wiped. Our spraying for the brown-tail ought to come somewhere around the first of August, and it is a question whether or not there is any poison from that. In most cases, where we are not troubled with the brown-tail and do not have to use the arsenate of lead spray, of course it would not be necessary. The fruit is certainly superior with the natural bloom than without.

MR. CASTNER: I would like to answer Mr. Powell's question. Wiping western fruit is being done away with. The apple buyers, buying the crop, do not wish it wiped. We realize that wiping interferes with the keeping quality of the apple. There may be parts of the West in which they are wiping fruit, but with us in Hood River Valley it is not practiced any longer.

MR. STAPLES: What so far has proved to be the best spray for the brown-tail?

MR. GARDNER: Arsenate of lead.

WEDNESDAY AFTERNOON.

RENOVATION OF OLD ORCHARDS.

MR. GEORGE C. DREW, Greenwich, Conn.

Until a comparatively few years ago the neglected apple orchard was a part and parcel of most New England farms, and I doubt if Maine was an exception to this rule. I said until a comparatively few years ago, because lately there has been such a systematic revival of interest in orcharding in general that it has called attention to these orchards formerly profitable but now neglected and going to decay. Unfortunately there are still many whom this revival has not converted, many who still believe these old neglected trees have served their day and their usefulness is past. I have been asked to speak on how these abandoned orchards may be reclaimed, how they may be once more put on a profitable business basis.

About seven years ago, as manager of an estate, I had charge of consolidating a large tract of land, buying up farm after farm as opportunity offered. These were all typical run-down New England farms,—each one of which had at least one orchard in various stages of neglect. In some cases canker was abundant, while in others San Jose scale had nearly ruined the trees; in all cases, such things as pruning, spraying, cultivation, and fertilization, had either never been practiced, or had been neglected for years. Some of the orchards, while comparatively young, had been so stunted as to be nearly ruined, while others were the old veterans of fifty or more years, with high tops beyond the reach of sprays or ordinary ladders. Such were our problems,—the problems, I am led to believe, of at least some of you. I must confess that at first I was somewhat sceptical as to results and in one case had even started to cut down the trees as too hopeless to even think of renovating. Fortunately I had the means and time available to work out the problem and now I would never cut down an old orchard unless it was in an extremely hopeless state.

Pruning.—It is quite a task to thoroughly renovate an orchard long neglected, and it cannot be accomplished in a day; still, it is often surprising to see how quickly it will respond to a systematic method of treatment. Let us consider the matter of pruning. Most of the old orchards were planted with the idea of cropping underneath,—consequently the lower branches were pruned off, so that we have long trunks and high tops. Under present day conditions we want the reverse,—low down, spreading trees, so that they may be more easily and cheaply sprayed, the fruit more economically harvested, and the danger from high winds greatly lessened. As most of these old orchards have been pruned up, our problem is how to get them pruned down. I have tried all methods, from cutting back to mere stubs in extreme cases, to simply heading in the more upright center branches. Where there is a severe infestation from scale and where the trees have been pruned up so there is an extremely long trunk, this radical method, with various modifications to suit different conditions, is advisable. In fact, in such cases, severe heading in is absolutely essential, as it is practically impossible to eradicate the scale in the high tops of old trees. The amount of heading in a tree can withstand will surprise one who has never tried it. I have cut off from twenty to twenty-five feet of the top in extreme cases and branches from eight inches to a foot in diameter. Generally it is advisable to cut back the top the first year only a part of the distance it should untimately be reduced to, not leaving the center of the tree open to the too direct rays of the sun. This cutting will cause water sprouts to start out on the limbs or trunk lower down and after a year's growth, these have a tendency to fill in the space. The top can then be reduced as originally planned, the water sprouts thinned out and headed in. In a great many cases, however, all that is needed to form a low-down top is to head in the main center upright branches. Check the growth here and it goes to the sides. After a little experience in forming the head, one can get the graceful drooping appearance in two years' growth, where only this small amount of heading in is required. Old trees long neglected are generally a tangled mass of branches; cut out all dead or cankered limbs, take out the worst of the cross branches, but do not attempt to completely shape the tree in one year. In all

cases our aim should be to get clean, new, vigorous bearing wood.

Surgery.—Cover the wound with some protective compound like coal tar or good lead paint. Do not be content with doing this once; two or even three times may be necessary so that decay may not set in. If there are cavities, dig out all decayed substance to solid wood, thoroughly tar, and then seal with cement, or otherwise exclude the water and elements. Cement is, however, liable to crack and it is advisable to cover with zinc or paint with tar. If there are bad forks or the tree is liable to split, bolt the trunks and use cable wire higher up in the branches. Bolts put through the limbs to hold this cable should have large washers and be threaded well up so that the slack can, if necessary, be taken up from time to time.

Most of our old orchards were either Baldwins or Greenings, so that the variety did not require changing. But in other cases where the varieties were undesirable, after reducing the top, grafting had to be resorted to, to make the venture profitable.

Spraying.—After the pruning and surgery have been attended to, the subject of spraying must be considered. Most of these old orchards had a severe infestation of scale,—some of the trees were in a desperate plight indeed. When the tops had been reduced so as to be reached by sprays our problem was much simplified. Still the first orchards were hard to clear up and it was generally two years before we had the scale under control. Now I am practically able to clear up an orchard in a single season, but not always with a single application. To accomplish this in so short a time, the work must be done thoroughly and when conditions are favorable. Oils, in my experience, are to be preferred to lime and sulphur when the scale is very abundant, as oils will spread while lime and sulphur only kills where it strikes. Lime and sulphur, however, has a wonderful effect in cleaning off the old bark and fungi, and even were there no scale in a neglected orchard, I would consider it a paying proposition to spray with this solution in the dormant season. A combination I like very much is to spray in the fall with the oils and then just before the buds unfold in the spring, spray with lime and sulphur.

Summer Spraying.—I have not touched much on spraying in the summer time, because I have been speaking of putting the trees in shape. We are adopting, as I suppose almost everybody else is adopting now, lime and sulphur with arsenate of lead as a summer spray.

Cultivation.—Wherever possible I believe in cultivating an orchard. Those neglected are always found in sod. In many old orchards the roots are too near the surface to plow. In such cases use a disc or cutaway harrow to break up the sod, and follow with the spring-tooth to maintain the surface tilth. If the trees are low down, as I advise, cultivate the spaces between the trees,—do not attempt to crowd in under the branches, as the active feeding roots will be as much benefited without it. While I strongly believe in cultivation, I also think at times it is advisable to seed down to a good clover sod to check a too rampant growth and also to aid in developing a higher colored fruit. I then cut the clover and let it lie where cut. I would let the orchard remain in sod until the growth of the tree or the character of the fruit indicated it should be broken up again.

Fertilization.—In all my orchard renovation work I have used chemicals instead of stable manure, although undoubtedly the latter will give excellent results if supplemented by such chemicals as supply potash and phosphoric acid. I buy and use chemicals in the raw state, rather than any particular brand of mixed goods. You are then sure of what you are getting and it is the cheapest in the long run. In various orchards I have used sulphate of potash, nitrate of potash, ground bone, wood ashes, nitrate of soda and basic slag. My main reliance has been, however, on nitrate of soda for the nitrogen, sulphate of potash for the potash, and basic slag for the phosphoric acid and lime. I prefer potash in the form of sulphate to muriate, although more expensive, because muriate robs the soil of lime. Phosphoric acid as supplied by basic slag seems to me much superior to acid phosphate, as I believe in sweetening the soil rather than souring it. The amount and proportion of these chemicals to use are problems for the individual grower. I would not attempt to prescribe. One can only determine by experiment. The color of the foliage and results of the harvest are good criterions to go by. In a general way I have used

on our soils when starting to renovate, about one hundred pounds of nitrate of soda, two hundred to two hundred and fifty of sulphate of potash, and four to six hundred of basic slag, per acre. Later I have used only a slight amount of nitrogen, one hundred to one hundred and fifty pounds of sulphate of potash, and three to four hundred pounds of basic slag, per acre, as an annual dressing, whether there were prospects for a crop or not. I have, however, when practicing clean cultivation, used legumes as a cover crop to furnish additional nitrogen and humus.

Thinning the Fruit.—For the past four years I have made it a practice to thin the fruit from all my bearing trees at least once, sometimes twice, during the growing season. This is quite a task, especially on older trees, still I consider it extremely profitable. It not only guarantees growing the choicest fruit, but it saves the tree from a useless strain. It is not so expensive as one would imagine who had not practiced it. I would say on an average, trees bearing seven to eight barrels of fruit at the harvest have cost us about fifty cents per tree to thin—not so expensive when you consider that choice fruit is the kind which brings the profit.

Time Necessary for Renovation.—Here, of course, we can only generalize. Where only a moderate amount of topping and thinning is necessary, one should be able to get good results the second year. In several cases I have in mind with such varieties as Greening, Northern Spy and Roxbury Russet, where the fruit was ill-shapen, with hard cores, and unsalable except for cider, we were able the second year to win first premiums on fruit from these same trees at our State fair. If more severe treatment has to be practiced, four or even five years may be required before a large yield can be expected.

Cost of Renovation.—Here again it depends so much on the size and condition of the tree, infestation from scale, etc., that we can only use an example by way of illustration. It may cost anywhere from one to five or more dollars per tree. Where there is no infestation from scale, the variety is not to be changed, or the tree does not have to be too radically cut back, the cost is comparatively small and need not deter any one. When the more serious conditions prevail the expense is relatively higher. Take for example a Baldwin tree, some

forty years old, with a spread of about thirty-three feet, comparatively high top needing to be headed back say six to eight feet but leaving plenty of bearing surface, the tree rather badly infested with scale and in neglect; I would figure about as follows to put the tree in good vigorous paying condition:

Cost of spraying material	$1 00
Cost of applying same	1 00
Cost of pruning and surgery	1 00
Cost of cultivation and fertilization	75
	$3 75

Results of Renovation.—I have in mind one of our orchards of two hundred trees, some forty years old, Baldwins and Greenings predominating. I had been told that not more than one hundred barrels of inferior fruit had ever been harvested from it in a single season. The Baldwins generally required severe topping, the Greenings a great amount of thinning. Scale was entrenched on every tree. Three years afterwards we were harvesting eight hundred barrels of choice fruit from this same orchard and it has borne regularly ever since. Another illustration I might cite is of a Baldwin orchard about twenty-five years old. Only a moderate amount of topping was necessary but the scale infestation was most severe. Three years after starting treatment we were harvesting on an average nine barrels of choice picked fruit per tree, while formerly it would not have yielded more than two barrels of inferior fruit per tree.

When you stop to consider the time and money it takes to plant an orchard and get it into profitable bearing condition, the value of these old trees if they can be renovated becomes more evident. In a recent bulletin issued by the Rhode Island State Board of Agriculture is a most interesting article giving the estimated value of apple trees at different ages. Taking Baldwins and Greenings as standard varieties, some correspondents place their value at forty years even as high as one hundred and fifty dollars per tree and at sixty years at two hundred and fifty per tree. Others figure from ninety to one hundred and twenty-five dollars at those ages. If they were in good vigorous bearing condition, undoubtedly they would pay good divi-

dends at those figures. But even at a much lower valuation,—say from twenty-five to fifty dollars per tree at forty years one can readily see what a valuable asset they would be to any farm.

To sum up then, in handling an old neglected orchard my experience would lead me to advise you:

First: Get your trees low down, or comparatively so, where they can be handled economically.

Second: Clean out the scale, if you have any, besides cleaning off the old fungus-laden bark on the trunks.

Third: Get new bearing wood on the trees which have long been stagnant, and keep the trees in good vigorous growing condition.

Fourth: Look out for cavities and decayed places in the trunks and limbs. Clean them out to solid wood and protect from further decay.

Fifth: Practice thinning your fruit in the summer time even though the cost is considerable. It is the best paying proposition I know of.

Sixth: Spray thoroughly, harvest your fruit with care, pack it honestly, put it on the market in attractive shape.

Conclusion.

Orcharding in New England is getting to be a great specialized industry. The areas now being planted with young trees are very extensive, which is as it should be, for those who go at it rightly. It is, however, no get-rich-quick proposition. Time and patience are required. There are many who fear it will be overdone. While I am not one of these, I realize the strategic value of an orchard already established. This is why I make my plea for the old neglected orchard—in a great majority of cases it has the power to "come back." If given intelligent care, its recuperative powers are such that even the most sceptical will be convinced if they proceed along these lines.

Ques. Did I understand you to say that the summer spray was the self-boiled lime and sulphur?

Mr. Drew: Yes.

Ques. No cooking at all?

Ans. No cooking except what is done with the heat of the

lime. We use Scott's formula. For peaches, 8-8-50; for apples, 10-10-50.

Ques. How do you mix that?

Ans. For the self-boiled lime and sulphur, we simply put ten pounds of stone lime into a barrel and sift in ten pounds of sulphur and cook that sulphur by the heat of the lime,—let it cook there until it forms a sort of orange precipitate, then we drench it with cold water so as not to let the cooking go too far, otherwise there is a little danger that you might burn the foliage with it. A person easily gets experience and knows just the color of the orange precipitate at which it should be cooled.

Ques. How much water do you use in the first cooking?

Ans. Just enough to slake the lime in good shape,—a very thin whitewash.

Ques. Do you cover it?

Ans. Yes, just to get the heat out and not let it burn.

CO-OPERATION THE NEED OF THE HOUR--FOR PRODUCER AND CONSUMER.

Hon. GEORGE T. POWELL, Ghent, N. Y.

Mr. President, ladies and gentlemen:

It is one of the great vital problems of the present time for the producer to get the value which he should receive out of his investment and the labor upon his land. We have heard a great deal about co-operation. There has been a great deal written upon it. It is very largely advocated at the present time as the one means of reducing the present high cost of living. We as a nation, for upwards of a century, were the best fed and the cheapest fed people in the world. But within the past few years there has suddenly come over our country an unusual advance in the cost of all food products. So great has been the advance in cost that it has brought consternation and alarm to thousands of consumers in our cities who are entirely dependent upon the foods produced from the land not only for their comfort but for their existence. And this extreme advance in values has attracted the interest of our entire country. So great has become the problem that a commission was appointed in Washington by Ex-President Roosevelt, after he had called a conference of the governors of the states, to take this entire problem under consideration,—the conservation of our natural resources, but very particularly the conservation of the fertility of the soil.

Our producers have had two problems to contend with. One has been the steadily declining productive power of their soil, and the other has been the increased cost of production. And hence it becomes a most vital problem to know how best to meet these conditions. For more than sixty years co-operative work has been going on in certain portions of Europe. Something like sixty years or more ago, in England, or rather in Scotland, a few poor weavers came together, I think about seven in number, and they proposed to put their small earnings

together and go to one of the retail grocers to see if it would be possible if they all paid cash to save a few pennies on their purchases. This was done, and the request was granted. There was some slight reduction in cost for the payment in cash for the purchases, and from that small beginning very extensive co-operative organiations have been formed in Europe which have brought back to the people who are co-operators a very important relief from the higher cost to which they had been subjected.

Now in our country it has been more difficult for co-operative work to be inaugurated for the reason that we have been such a great country; we have done things on such a great and wholesale scale, that it has been difficult to concentrate, particularly with our producers of food products, along these co-operative lines. The only really successful co-operation, perhaps, to which we can point is in the Northwest. There is at the present time in California an organization known as the Citrus Fruit Protective League, which is working along the co-operative line with wonderful success. That great organization, which is doing business at the present time to the extent of millions of dollars annually, has been enabled to bring to the growers of oranges and lemons and other citrus fruits very much more money than they had received before they went into this co-operative organization. At the same time it has been possible for them to so distribute their products over the markets here at the East, our entire country and foreign markets, that they have been enabled to furnish the consumers with all these choice fruits of California at a somewhat lessened cost to them. Now there is one illustration of how co-operation in our country has met with eminent success.

We may also point to the illustration which comes to us from our western fruit growers in Oregon and Washington and the western states, where the fruit industry has been recently organized upon a large scale. The reason for the great success of our western fruit growers lies in this fact, and I want to say here that I believe that the best fruit growers in this country, the most succesful fruit growers in our United States, will be found in this great western and northwestern territory. They do so comprehend and understand the necessity of working together along these co-operative lines that

they are making an absolute success in their work in this direction.

Now why is co-operative work successful at the West and so difficult to inaugurate here in the East? In the first place, when this western land was taken up in these great northwestern sections, the fruit growers who began to plant orchards realized that they were at a disadvantage, being so far from market. When they undertook to ship the products of their orchards as individuals, the high cost of freights, the cost of handling their products and getting them into our eastern markets, used up absolutely all the profits there were in the business. They could get nothing out of their business so long as they attempted to ship here to our eastern markets upon the basis of the individual grower. Realizing this fact they came together as growers. They organized fruit growers' associations or unions. They entered into a compact that they would put their product together. More than that, in addition to agreeing to have their fruit packed together upon this co-operative basis, they established other rules and regulations. They at once realized that it was important, shipping such long distances and at a high cost in any event, that they put only the very best product in the eastern markets, and hence they established rules for grading and packing. They established the size of the box. They established standard grades. They required the packing of all of their fruit to be exactly to the standard that was branded upon the box. Now individual growers could not do this by themselves, but they could do this just as soon as they combined or organized and set up certain standards to which they should come in the grading and packing and selling of their products. More than that, they saw the necessity of producing fruit of the finest quality, and hence among their rules and regulations was incorporated the obligation upon every member of their union to spray his trees, to keep his fruit absolutely free and clean from insect blemishes and from the fungus troubles which they have at the West even more than we have here in the East. And hence these intelligent men, when they found themselves off there on the western coast, so far from our markets, saw that their only salvation was to work along these co-operative lines. I think I may say here this afternoon, there has been no co-operative work in this

country that has ever succeeded except that which came through necessity. And that is why our western brethren in fruit growing have been so successful,—because they were forced by necessity to work along these lines.

Now let us look for a few moments at our eastern conditions. To my knowledge there has never yet been a long established or successful co-operative organization anywhere east of the Rocky Mountains among fruit growers. And why? Simply for the reason that here in the East, right side by side with our orchards we have a ready market, and up to this time it has only been necessary for the fruit grower to pack his fruit and send it to market in order to get something for it. It has not been essential, as he has thought, for him to spray his trees until within recent years. He has not been forced to spray until the diseases have made their appearance and until insects have so increased that it has made a large proportion of his fruit poor and wormy—it has only been through force of these conditions that the eastern fruit growers have within the last number of years taken up spraying. Here again we see necessity is forcing better methods upon our fruit growers of the East in the general increase and spread of insects and also of fungous diseases. We may consider, perhaps, that the San Jose scale has after all been a great blessing, because, as it has made its inroads step by step over our fruit territory, the owners of trees have been forced to take up this problem of spraying, and hence we may think that instead of being a calamity the San Jose scale is absolutely a blessing, because this is going to lead us up step by step now to other measures of work which we stand in need of performing here in the East.

So extensively has the western fruit been brought into our eastern markets, with its beautiful color, with its exceedingly attractive packing, that steadily, degree by degree, western fruit has taken its position in our markets. It has simply taken the lead over everything that is brought here into our markets by way of fruit, particularly of apples. Now that is making trouble for the eastern fruit grower who is careless in his methods, who for years has been sending to the market anything that grew upon his trees regardless of quality, of grading, or packing. The eastern fruit grower can no longer go to his orchards, pick his fruit, put it all into barrels regardless of

quality, and get anything out of it by way of profits. So up to this time, for the reason that it was so easy simply to pick his fruit and ship it to any of these near-by markets of which we have so many here through the East, the eastern fruit grower has not felt it necessary for him to work along any lines of co-operation.

But I believe the time has come now for co-operative work; and I have been very much interested since coming here at this time to learn of a few young men not very far from here in Maine who have formed themselves into a co-operative association. These young men have thrown the interests of their orchards together. They have adopted the western system of grading and packing. They are using the box instead of the barrel, and they are shipping their fruit into your markets here and receiving values far above those which are generally paid for other fruit. Now I believe the time is coming rapidly as the result of such meetings as this, where there have been such splendid demonstrations given in the packing of fruit, and where there has been such a magnificent exhibit as is seen here at this time, when more of co-operative work will be done. The evidence is before us that you can grow here in Maine and throughout New England a quality of fruit that will equal the finest that comes from any portion of the United States, not only in point of size and color, but when it comes to quality it leads the world. Now as fruit growers it is only necessary at this point to take the right steps, and those are to form yourselves as fruit growers into fruit growers' unions; then to adopt a rigid system of practice which must be insisted upon by every member. Now this is going to be a test, to agree to come into a co-operative association and abide by an agreement. I believe in order to succeed in this matter it will be necessary to make some very cast-iron rules. For instance, one of the requirements in the western organization is that a contract must be signed by the co-operators, by the members of these unions, that they will turn their whole product into the Union. No individual is allowed to pack his own fruit at the West, just as we have been told here, I think, this morning by the very skillful, expert packer, whose skillful work interested us so much. No individual can be allowed to pack his own fruit. And why? Simply because there is so much difference of

opinion among the individuals as regards the standard to which they would pack. This cannot be left to the individual. It must be determined by the Union itself. Its rules and laws must be fixed and then its members must subscribe to the rules by contract. At the West if any member who has signed a contract to deliver all his fruit to the packing house, or to have it packed by the Union, by any means withdraws his fruit and sells it to some one else, who he thinks may pay him a little higher value, he is fined so much for every box of fruit that he sells. He has to pay the penalty for the violation of his contract by paying a fine which is collectible.

So I believe that in the organization of co-operative unions here in the East, it will be important that in the formation of the organization there be absolutely rigid contracts drawn which every member will have to subscribe to, that he shall not be tempted to let his fruit go to some buyer outside who may come and possibly offer him a little higher value than he thinks he may get through his Union. This will be an entirely new line of work for the eastern fruit grower to take up, but I believe that it is the only salvation of our eastern fruit growing interests, and that just as soon as that is done, and we put ourselves along these lines of organization, and put up our fruit as this is put up here before us today and send it into our markets, we will have the lead of the markets of the East absolutely and the West will find it will be unprofitable to send so large quantities of its fruit here as is being done at the present time. Why, the western fruit growers already recognize this fact. I have the most profound respect and admiration for the fruit growers in the West. They are splendid business men. They see the danger that confronts them in this eastern development when it shall be put upon the lines of co-operative work. I was very much interested last week in the great Land Show at New York in Madison Square Garden, in seeing eastern people go to the managers and directors of these different western exhibits and ask this question: "Your fruit is beautiful in color, it runs fine in size, but is the flavor of your fruit equal to that which is grown here in New York or in Connecticut?" I want to say that these men were honest and they stood and shook their heads. They all recognized the fact, and said so, that we had the best of them in point of quality. And that is what the

western fruit grower says today, and as soon as our business is put upon this basis, we will find a large number of our western fruit growers coming back here and seeking eastern land upon which to grow fruit, because they know the great advantages which we hold here at the East as soon as we adopt western methods. I discovered that many of those western fruit growers believe that the great future of this country in fruit culture has its highest value here in our eastern land.

Another point which is of great value in co-operative work is the legislation which it is possible for fruit growers to obtain when they are combined in organization. At the West they have no difficulty about careless neighbors, because every western state has upon its statute books today laws that are rigidly enforced against insect pests and diseases. It is only necessary for any fruit grower in the West to receive notice that he has insects upon his trees that are injuring his fruit which he must attend to promptly—it is only necessary to receive a notice from the county commissioner, or the county inspector, and when he receives such notice he must move promptly to treat his trees. If he does not do it, it is done by the county commissioner and the cost is assessed upon his property. This is one of the great advantages which come from co-operative work, that when a good law is obtained there is power to enforce it in the community. Now you and I who try to take excellent care of our orchards are continually called upon to meet a large expense through the carelessness of our own neighbors. For instance, I will cite what occurred in my case this last year. The San Jose scale had been introduced, unfortunately, upon some nursery trees in two or three different plantings, undiscovered by the nurseryman, undiscovered by myself, until several years afterward we found that in different parts of the farm the scale had got in and was spreading. And of course when you once get it on your place it is like the poor, you always have it with you. Now we have sprayed exactly as Mr. Drew has outlined here this afternoon. We have used the soluble oil sprays. We had it as we supposed fairly well cleaned up last year. Our trees bloomed, the fruit was beautiful and clear until along about the middle of July when we discovered here and there a little appearance and increase of the scale again, and in going through the neighborhood and examining the trees on all sides

of my farm I discovered that they were badly infested with scale. On some of the young trees the scale was so thick it was utterly impossible even to see the bark. Millions of young scales were constantly moving about on these trees, birds were lighting into them and flying over my own farm from the borders, and the wind perhaps had been carrying them to a certain extent. There was infestation on all sides from the neighbors who have only a few trees and yet have no interest whatever to spray them. I am glad to say that in New York State we have at the present time a similar law to that in the West, where it is obligatory upon every owner of trees to spray them, and if a complaint is entered, the state authorities now have power to step in and oblige the owners of these trees to spray their trees or the State can do it and assess the cost upon their property. I am very glad to say that New York has this law and I trust not far in the future it will be the legislation upon the statute books of every state in New England.

Now comes another phase of this discussion, and that is, How is it going to be possible for us as fruit growers to get higher value out of our products? This, I think, is one of the most difficult problems which we have to meet today. In the first place we can never bring to ourselves the lessened cost which we feel that we must secure in our business until we organize. We need to organize along these co-operative lines in buying the supplies for our orchard work. We need to organize in associations or unions and instead of buying small quantities of spraying material and fertilizers buy together as an organization and in so doing we shall get all the materials which we have to use at the lowest possible cost. Now this is one way in which we can reduce the cost of production and receive a little larger value from our product.

Another very important problem is how to get our products more directly before consumers, and this is a difficult problem. We have heard a good deal of criticism, of course, against the commission merchant, and a good deal of it is just. Yet at the present time we could not do business without the commission man. It would be utterly impossible to move the products of our great country, especially our fruit, without the aid of the commission man. And yet when we put it through that channel we find that the commissions which we have to pay take off a

large per cent of profit from our business; because it is expensive to sell through the commission man. Now if he is an honest commission man he of course is a very great aid to us at the present time, but unfortunately all the men in the business are not honest. The fact is, there are too many men in the business and in order to live, in order to pay their expenses, it is quite the practice among some of them not to return honest sales. I don't know whether I have given you any illustrations or not along these lines, but I had a client whom I was advising here in New England who sent his fruit to the Boston market. He was not receiving for his apples what he supposed he should receive, nor according to the quotations of the Boston market. He was a banker and I had advised him in the purchase of a farm and had laid out for him his general policy for spraying and cultivating his orchards, and indicated to him that the Boston market was one of the best in this country and that if he grew good fruit he certainly would get satisfactory prices for it. I received a letter from this banker saying that he had shipped a large quantity of his apples all through the autumn and into the early winter and was not receiving what he thought he ought to get. His general sales were $1.50 a barrel when reports for fine fruit ran up to three and four dollars and even four dollars and a half a barrel. I replied to him that if he was positive that his fruit was well put up and carefully graded and shipped in good condiion, he certainly should receive more than he was getting, and advised him to put up fifteen or twenty barrels of his best fruit as he had been doing, send it in to the same salesman, send in his own farm foreman and buy the fruit himself and then he would find out what he should receive. He did so, and when his farmer reached the market and the truck drove up with his twelve or fifteen barrels upon it and was unloaded, he stepped up to the sidewalk and began to inquire the price of apples. He saw his own barrels unloaded and opened and examined them critically and said that evidently that was pretty good fruit. He wanted assurance that the fruit ran uniformly through the barrel as it was opened and he was made to understand that the fruit was absolutely packed honestly and could be depended upon. He inquired what would be the price for that lot of apples if he should take the whole of them, and he was

given a price of $4 a barrel. He paid for the barrels and had them shipped to another part of the city, and two days afterward came back his bill and check for the sale of apples at $1.50 with 10 per cent commission and freight deducted. Well, being a business man, the banker had no controversy but he made out a bill for all the apples that had been shipped to this firm for $4.00 a barrel, stating that he had not been satisfied with the prices that had been returned to him, he had bought his own apples, he knew what they had sold for, and he asked for payment for his entire crop—and the check came back by return mail. Now there is a class of commission men in the business that is a curse to the commission business. There are men who will not do that. There are just as honest men and upright men in the commission business as in any other line, but, as I have already said, there are too many men in the business, and they have to live, and it has become a matter of book-keeping, not a matter of sales, with that class of men. They simply will average sales and you get your average no matter what price your fruit sells for. That is one of the difficulties of doing business as an individual today through the commission channels.

Now if you are organized along the lines of a co-operative association or union that thing would not happen, because the manager of your fruit before it went anywhere would know the character of the men who are doing business. He would look up the standing of the commission men. Your fruit would go into the very best channels, you would get the highest value that the market would pay you and you would have returned back to you again the full value for your fruit according to the values of the market. You would be dealing with the best class of men in the commission business and not with the irresponsible speculator who can set up a stand on the street anywhere and if you attempt to find him, can not be found. Many farmers and fruit growers have lost immense sums of money by shipping to irresponsible men who bring discredit and disgrace upon the best class of commission men in the business. So you would be safe in these matters if you would work along the co-operative lines.

Now there is another side to this question, and that is how we can most directly meet the consumer. A very

careful study must be given to this subject of more economical distribution of our products. It costs too much today to get the product from the farm to the consumer, and the consumer is paying altogether too much in proportion to what the producer receives. Here is a very great problem, to know how the system of distribution and sale may be changed and economized. I believe that the prices charged by retailers are too great. I believe that the retail dealers are responsible to a large extent for the present high cost. This again is another side of this question for us to work out. We cannot bring wholesale condemnation against the retailers. There are a great many who are scarcely making a living. But there are too many men in the business again, in the retail trade,—that is one of the problems. In New York City there are today over 14,000 retail grocers, and upon a careful investigation of the standing and character of these men, the facts are known that less than 3000 of them are responsible and can pay their bills and rents. There is so much competition in that line, there are so many retail grocers who are paying high rents and who are selling their goods at a high cost that it interferes with the legitimate business of that great city. They all have to pay their rents, they all have to pay the cost of distribution, and hence those who are in the business as responsible men have this competition to meet, have their trade divided, whereas if they could receive this trade to a large extent the retailers could do more business, reduce their cost, and make more money from their business than they are doing today. Here is one of the big problems in our cities, this question of competition, and those who are in business as retailers running up the very great cost at the present time upon consumers.

There is another side of this question which we will have to study and meet, and that is connected with the consumers themselves in the cities, who are somewhat at fault. Instead of buying in larger quantities—for instance, buying apples by the half bushel or bushel—they buy by the quart. Now let me give you just a few figures if I can recall them. I have had no time whatever to prepare or arrange anything for this discussion and hence I am speaking as the subject presents itself to me this afternoon. I made an examination of some of the bills of some housekeepers in New York several weeks ago and I found

that they were paying for onions, twenty cents a quart, which is at the rate of about $6.20 a bushel. On that day in the market onions were selling for 75c to $1 a bushel. That is what the grower received when he shipped onions into New York market the same date. I found in some instances consumers were purchasing apples and paying 25c a quart for them. Now the consumer in buying that way was paying at the rate of $25 a barrel. On that same date the best apples in New York City were bringing to the producers only $2.50 and $3 a barrel. Note the difference between what the producer received and what the consumer was paying on these same dates. The trouble is that the consumers are buying in too limited or small quantities when they ought to buy larger quantities and increase thereby the consumption of these products, which would leave no low priced surplus upon the market.

This whole problem of co-operation is one which we have to take up, and it is one which it is going to take years to develop along the lines that will equalize the cost which the consumer pays with that which the producer receives for his products. It is not a problem that can be settled today or tomorrow. The work must be taken up and studied as a problem. First we must learn to produce more cheaply. We must study methods of economy in production. Then we must take up the question of transportation. I do believe that the day is coming when this country ought to have a postal express. I have not time this afternoon to take up this question, but I do believe that the express companies of our country are standing in the way of the cheaper distribution of many of our products which we ought to have, and hence the postal express, which is coming again before Congress, should receive the support, the study and the intelligent thought of every citizen, who should demand and urge that we have a postal express by which, as they do in Europe, we can get large quantities of products sent by express, and delivered cheaply to the consumer at a very much less cost. The railroads and the trolley lines of portions of Europe are loaded down with the products that are going from European farms direct to the consumers by express, delivered promptly and quickly, at a remarkably small cost. It is important that our carrying facilities be enlarged and the cost cheapened. When we proceed along these lines I believe we shall reap benefit to

ourselves as well as to the consumers who are dependent upon our farms for their products.

Now Mr. President, this is too large a question for me to attempt to pursue longer in discussion. It is one of the most vital that is before us at this time, and will be one of the most important problems of the future. But I believe as the result of such gatherings as this, when you are able to produce such beautiful quality of fruit as you have brought here this year, the getting of this product so much desired in our cities to the city consumer in the fine condition in which we see it here today, and at least cost to the consumer, will be accomplished.

PRACTICAL DEMONSTRATION IN PRUNING FOR SETTING, AND TRIMMING TO SHAPE TREES.

By Hon. Geo. T. Powell.

The first tree which I take in my hands is a tree which I want to condemn. I do not believe in what is known as the piece root,—the root grafted tree. I do not like it and you will see the reason why. There is a very small quantity of very fine roots upon that tree. While the tree is well grown otherwise, it is really deficient in roots, and I would rather pay a much higher price for a seedling tree budded than for a piece-rooted tree. But I shall proceed to prune this tree in the way it ought to be pruned, and the object in pruning is to get more roots upon it. It has a deficiency of root and never will make any growth whatever until that root is pruned so as to get a large quantity of roots upon it. When that tree is planted it will begin to throw out a new system of roots at each cut which has been made here. There is stored up in the roots of all trees a material which is all prepared to go out and manufacture new roots. This tree will make a good tree in time, though it will not make a tree equal to a seedling. Just as soon as you make a demand upon the nurserymen of our country to supply you with seedling trees, you will get them, and I would advise you to get them and pay a little more for them because it is a better way of propagating trees, in my judgment. Now I like a low headed tree. I do not like this tree for the reason that there is a crotch in it. The branches come out just opposite and by and by when this gets to be a full grown tree with its system grown out on both sides, the tree will split right down in the center and just when it comes into its value you lose a valuable tree. I would like the head of this tree to be cut down from 20 to 25 inches.

In setting the tree I would set it about two inches lower than the point where it is grafted. I believe in fairly deep setting of trees where the soil has a good open drainage in the subsoil.

Ques. Would it be safe to set the tree as low as that where there is so much snow as we have in this State?

Ans. Well, that is rather a difficult question for me to answer, not having had the experience of deep snow, but my opinion is that by properly pruning these low headed trees, cutting on the lower side as they grow older, you will so strengthen the branches that they will hold up a pretty heavy body of snow. My own experience with low headed trees is that I am getting quite an upright growth. The branch enlarges and continually grows stronger, and I am careful to prune the under side of the branches in order to throw the growth upward and strengthen the growth below.

Ques. How long would you continue to do that heavy pruning?

Ans. I wouldn't prune a tree at all after I had set it out, for five years at least. I would shape the tree as perfectly as I could, and then do no pruning except, if a branch goes in the wrong direction, to slip it out.

I will take now a tree that satisfies me. This is a whole rooted tree; it is a seedling bud. You can see the difference between this and a piece root tree. The piece root tree must have a little time to start and we do not want to be obliged to give our trees time. When we put a tree into the ground we want that tree to forge right ahead, from the time it is planted. The piece root tree must have a little time to re-establish a strong root system from the pruning, while the whole rooted tree goes right ahead.

We will now prune the whole rooted tree. Taking into consideration the top, I should say, cut back the roots of this tree about one-third, right around. Cut every root on the tree. Why? Because even in this system of finely rooted tree you want to get just as much root as you can and every cut you make will cause a new system of roots to be thrown out. In six months time you will be surprised to see what a splendid root system the tree will have.

Ques. How large and how deep a hole would you dig for that tree?

Ans. I would like to have a hole at least 24 inches wide and at least eighteen or twenty inches deep. Have plenty of room

for the roots to spread out and still room beyond that for them to develop for a couple of years.

Ques. Would you loosen up the soil in the bottom of the hole you made for that tree?

Ans. Yes, if the soil is a little bit hard. If it is a close subsoil, I would send the diggers down with a pick as far as they could go with it after digging the hole. It is best in planting a tree to take time and pains.

Ques. Would you advise dynamite for making the holes?

Ans. I haven't had any experience with dynamite. I think it depends on the character of your soil. If you have a subsoil that is of a gravelly loam nature, even if there is a little clay in it, I should not think it would pay to use dynamite. I think you can do it cheaper by hand digging. But if you have a pretty hard, close, tight subsoil, it might then be desirable to use dynamite. I should say it would not pay in such soil as trees ought really to be planted in.

Ques. Would you plant the tree deep enough to cover the bud?

Ans. Yes; I should set that tree down at least two inches. I want to be sure that the tree has roots down where they can get moisture in a dry time. If we set our trees too shallow and have three or four years of continued summer drought, the roots will be injured. I prefer to set them deep, particularly in soils naturally well drained, because then they are safe from drought, if they are down where the roots can go into a porous subsoil.

Ques. Would you dig into a clay subsoil for the sake of setting the tree deep?

Ans. If the clay subsoil is close I should not dare open it very much for the reason that there will be danger of the water settling and not getting away fast enough. When the subsoil is close enough to hold water I would not set the trees quite so deep.

On the next tree, which I have here, one branch is so situated against the side that there is danger of its coming off, and I would take it off now. It seems like taking off a valuable part of the tree, but it is much better to do this now than to have the branch break off fifteen or twenty years from now. This tree is too high headed to suit me, but if you in Maine do not

want low headed trees then I would prune the tree in a manner to save a branch as low down as you can get it. Get the tree started with an open head and let the pruning after this be on the top of it. Do not let it go up into the air so that a thirty or forty feet ladder will be required by and by to pick the fruit. Keep it developing outward, giving it a good spread where the sunshine can get into it. There is not much trouble with sun scald here. Of course in the South the pruning would be exactly opposite, the object being to protect the fruit by growing up a close head and keeping the fruit inside. But here we want our fruit thrown right open to the bright sunshine. Hence, keep the tree open-headed, and keep the top down. Then you can control the brown-tail, the gypsy, the codling moth or the San Jose scale.

The next tree has a little bend in it but that will straighten up and in a few years you will have a beautiful tree, perfectly straight. But this tree has started to be a high header, and that should be stopped right away. First I would take the center right out, and this requires a saw. We have a little saw known as the Diston pruning saw which is very good for such work, —a saw not more than half an inch wide, put on a handle, with a swivel so that you can turn it at any angle you wish. It is the Henry Diston swivel pruning saw, manufactured in Philadelphia. Now proceed to shape up this tree as you want it, cutting every time, if you can, to get the bud on the under side so as to change the growth of the tree outward instead of upward.

Ques, How would you set that tree,—with the bend to the wind or against it?

Ans. I would set it with the bend against the prevailing wind and the wind will help to make it straight. That is an excellent tree with a very good spread in all directions. I care not what the variety is, even if it is a Northern Spy, on my farm I can have it producing fruit at six years of age. Usually at twelve years of age you get a Northern Spy into bearing here in New England. This year I have taken as high as 50 to 55 apples from a seven-year old tree,—beautiful, fine fruit.

Ques. Is any summer pruning done here in the East?

Ans. Not as a general thing. I have done a good deal on my own place and the summer pruning enables me to get the

Northern Spy into bearing much more quickly. If the tree is pruned each year you will keep it growing for twenty years before you get much fruit. Let it fill right out with branches and wood and in a short time the tree will begin to push out fruit spurs, fruit buds will develop, and in a few years you will get a good bearing Northern Spy tree.

DR. TWITCHELL: Here is a three-year-old tree, and we would like to have Mr. Powell shape the top of it.

MR. POWELL: That is a rather hard one to prune. Here are two crotches,—practically three—right together. It is bound to be a bad tree if left as it is, and it is a very difficult tree to get into shape. By taking out two branches I will get rid of two crotches, and then it can be built out in any system you want.

Ques. Do you prune just before setting in the ground or immediately afterwards?

Ans. It depends on circumstances. If we have time enough we prune before we put them out. If we haven't we set the trees and prune them afterwards.

Ques. After they are set out, would you prune any of the growth for four or five years?

Ans. For five years at least I would do no pruning on those trees except to slip out a branch that is going in the wrong direction; simply keep the form which I have started. Let the tree fill right up with wood and when it gets to be seven years of age, cutting with the Diston saw, begin to take out overgrowth here and there. You have got the tree bearing and then is the time to take out your surplus wood, but if you begin now you will keep the tree growing and not bearing fruit.

FRUIT GROWING, EAST AND WEST.

PROF. F. C. SEARS, Amherst, Mass.

As you probably all know, I have done more or less talking during the past three or four years, on the subject of apple growing in New England. I have told people that there was money to be made out of it, if properly conducted, and have shown my faith in the business by going into it myself. And I have insisted that New England had very distinct advantages over the West. I still think so. But I want to tell you confidentially that for the first week of my stay in the Northwest I was staggered, and began to consider whether the Bay Road Farm (the farm Professor Waugh and I have at Amherst) could be worked over into a poultry farm or a game preserve. For I never saw before and may never see again such beautiful fruit. I had expected to see fine Newtowns and Spitzenburgs, but to see Baldwins and Rhode Island Greenings, absolutely the most beautiful things in the apple line, was rather disconcerting, for I thought they were New England specialties. I said to myself, "My boy, you had better go home and apologize to the orchard men of New England for attempting to lead them astray." This impression of their beautiful fruit stayed with me during my entire trip, and will always stay with me. Their best fruit is a glorious sight and a thing to be proud of, and I take off my hat to the men who grew it. But the longer I stayed there and the more I studied the matter, and in particular the more I got behind the scenes and talked with the growers, the more "comfortable" I felt and the more sure I was that I should not need to offer that apology to the fruit growers of New England.

My second and most vivid and lasting impression was that every man, woman and child of those sections was interested in apples. I never saw anything like it! Not only is the whole county, of such a section as Wenatchee or Hood River, one vast orchard, divided up merely by the roads which run through it, but every business in the county is conducted by and for the

fruit men. The banks are officered by orchard owners. The souvenir cards represent some kind of fruit or some phase of fruit growing,—perhaps two apples taking up the entire space on top of a flat car, or a man hauling a single pear out of his orchard with a team of horses. The hardware stores are full of every contrivance for the benefit of the fruit grower, from cement coated nails for his apple boxes to the latest type of box press. Every orchard section and every railroad has its advertising booklet, ornamented with apples in colors, and even the ladies' hats, instead of looking like a dish pan or a coal hod, as they do with us, looked like a peach basket or an apple box. I can see in this universal interest in the orchard business both an advantage and a disadvantage,—both a hope and a menace. On one hand, it is bound to push the industry forward, it has already done so, and will always do so with any industry, when many men engage in it in a single section. What one man does not think of, another man does, and the business as a whole is wonderfully advanced. On the other hand, if the time comes when this industry fails or is seriously crippled (even for a single year), the whole country is affected, and disaster is almost certain.

My third impression was in regard to their laws. They are certainly sweeping, yet everybody believes in them and supports them. Two examples will serve to illustrate them. At Wenatchee, we were most royally treated by Mr. Mike Horan (a Massachusetts boy, by the way) who is known as the "Apple King of Wenatchee" and who took us all through the valley in his automobile. As we were passing a large orchard, I noticed a big pile of apples, several hundred boxes, piled up near the packing house. They were close to the road and looked perfectly good and I said to Mr. Horan, "Why don't they market those apples?" "Oh," he said, "they are defective ones and we are not allowed to. You could buy that pile of apples, but you couldn't send them outside of the State, the law would not allow it. They can be made into apple butter, vinegar, or champagne, but cannot be sold in a fresh state." Think of that! Fancy what our New England growers would think, and say, if the State should step in and not allow them to market their windfalls and wormy apples! Another day I was talking with a commission man in Seattle about their inspection laws. He told me that they were frequently visited by the state inspectors

who looked through the apples on sale, and if they found a box with codling moth in it, for example, or with any other orchard pest, they would put a mark on the box, and a little later a team would call for that box, it would be taken out to some vacant lot, saturated with kerosene oil, and burned up,—root and branch, codling moth and apples. The owner would not only get nothing for his apples, but he was obliged to pay for the cost of taking them out and burning them! If every package of New England apples in the Boston markets today which contained apples affected with codling moth or railroad worms were taken out and burned, how many do you suppose would be left? I fancy that the cost of good fruit would take such a jump as it never did before. They certainly value the good name of their fruit out there, and this is one reason why it has such a good name. And we might with the greatest profit copy after them, I think. Some of you may remember a talk given by Dean Davenport of Illinois at a recent meeting of the Massachusetts State Board of Agriculture, in which he spoke at length of the Pacific Coast fruit industry. And he gave as a reason for their success that they had learned that two good apples were worth more than the same two good apples with two poor ones thrown in. I often thought of that remark in my wanderings in Oregon and Washington.

My fourth impression was of their climate, and I want to say right here that while we sometimes growl about the weather we get in New England, it is good enough for me! I was in Hood River for most of three days and it rained practically all the time I was there. We took a drive of twenty-five miles through the valley one afternoon in spite of the rain, and we asked the driver whether it always rained there. "Yes," he said, "at this time of the year! It begins about November 1 and rains all the time up to the middle of January, when it stiffens up and we have two weeks of sleighing. Then it begins to rain again and rains nearly all the time up to some time in April, and from that on into May it rains part of the time. Then it stops and doesn't rain any more until the first of November." Just imagine such a climate! Rain all the time until everything is soaking, the roads are gullied, and one hates the sight of clouds! Then sunshine and no rain at all till the dust is as thick as the mud was before, and one would give a month's salary for the sight of a single cloud! It certainly gives color to their fruit,

but I should think that it would also give color to their language!

My fifth impression was in regard to the work of their co-operative unions. It is certainly responsible in a large degree for their success. It is co-operation all along the line,—buying, handling and selling. They establish, in packing, definite grades, as follows:

"EXTRA FANCY—In this grade all apples shall be sound, smooth, free from worms, worm stings, water core, scale, sun damages or diseases of any kind, and of proper shape according to the variety. No apples smaller than 165s shall be allowed in this grade, nor any apples that are of a red variety that are not at least three-fourths red, except that Rome Beauties one-half red will be taken in this grade. Yellow Newtowns, White Winter Pearmains, Grimes Golden, Bellflowers and Winter Bananas will be allowed in this grade, but no other variety of yellow apples. Winter Bananas and Red Cheek Pippin must show a red cheek."

"FANCY—In this grade also, all apples must be smooth, sound, free from bruises, blemishes, worms, worm stings, water core, sun damages, or diseases of any kind, and of proper shape according to the variety. No apples smaller than 165s shall be allowed in this grade, excepting apples of the following varieties, which will be accepted when packed as small as 200 apples to the box: Winesaps, Jonathans and Missouri Pippins when red all over. All apples of red varieties ranging in color from three-fourths red down to one-third red will be included in this grade. All varieties of yellow apples will be allowed in this grade."

"GRADE C.—This grade shall be made up of all merchantable apples not included in the Extra Fancy and Fancy grades. These apples must be sound and free from bruises, worm stings, and other diseases. Skin to be unbroken, but will include misshapen apples or apples having a little limb mark or other like defect. This grade will include apples of all colors and as small as 200s, but no smaller. It is optional with the buyer whether this grade is wrapped or not."

Then they insure that these grades shall be lived up to by putting the packing of the fruit into the hands of entirely disinterested parties. Every packing house is in charge of a boss

packer who is responsible, not to the owners of the fruit, but to the Union. And if the owner objects to the way things are carried on, his redress is through the Union. We all know what this type of marketing has done for them. The Rural New Yorker recently contained a statement from Steinhardt & Kelley, from which I quote the following:

"Our contract with the Hood River Apple Growers' Union, as represented by their board of directors, is certainly a very stringent one, they guaranteeing us a perfect pack and also guaranteeing that every apple in every box is absolutely perfect. We have handled several hundred thousand boxes, and never have we found ourselves in condition to make a single complaint against their pack. It is as near perfect as human ingenuity and honesty of endeavor can make it; in fact, we shall be glad to have you drop into our place of business at any time and take a box of fruit from the heap, and you will find that every box is practically identical, and that every apple is absolutely perfect, whether you open the top, bottom or side of any package. This is more than we have been able to say for any other large pack of fruit that we have ever contracted for."

In order that the packing may be satisfactory, the Union is very careful who does it. No one is allowed to pack who does not have a license from the Union, and only those who have proved that they are capable will be granted such a license. In order to keep up the supply of good packers, they conduct each fall, at the beginning of the packing season, a "packing school," where every one may get two weeks of practice under expert supervision for $15. At the end of that time, any one of ordinary ability should be reasonably expert. If the "graduate" from this school packs for members of the Union during the whole season, he gets a refund of his $15 at the end of the season. Isn't this packing school something which we ought to take up, whether we adopt the box or continue to pack our apples in barrels?

I should like to continue this discussion of general impressions, because there are several other matters which interest me greatly, but I must pass on to the second section of my subject, viz., a comparison of New England and the Pacific Coast.

Some three years ago, at the request of Mr. J. Lewis Ellsworth, Secretary of the State Board of Agriculture of Massachusetts, I wrote a bulletin which was called "Western Methods in New England Orchards," giving my notions as to the reasons

for western success in orcharding and as to the comparative advantages of the East and the West as apple growing sections. This of course was without any first hand knowledge as to the West. I was greatly interested, therefore, to "check up," in this recent trip of mine, the impressions I had received from reading and talking with others, and from observation of the western fruit in our eastern markets. And it was a source of considerable satisfaction to find that my long-range impressions were generally sustained on closer examination. I want now to record my notions on this point, both because many are still looking to the West as the only (or at least the best) place to grow apples, and because those of us who are taking up the fruit business here in New England need every encouragement to keep us "strong in the faith."

I believe that the following is a fair, and I hope impartial presentation of the case of the western apple sections. Their advantages as I see them are:

(1) That they can and do, as I have said, produce fruit of the very greatest beauty, more handsome than we produce in the East. I know some of you will want to object to that, and I know that some of our finest fruit leaves little to be desired from the standpoint of beauty, but I, for one, am willing to admit that as a class western fruit is prettier to look at than eastern. I certainly never saw anything quite so handsome as some of the Baldwins, Rhode Island Greenings, York, Rome Beauties, etc., which I saw on exhibition at Vancouver and Spokane last year. And since looks will always be an important item in selling fruit, we must concede that the western growers, as a class, have a distinct advantage there.

(2) Their trees bear earlier, I should say from two to three years earlier on the average. This, I think, is principally due to their very long season, which really allows the tree to do the same amount of growing, to reach the same amount of maturity, say in four years that our eastern trees reach in six. Take the following examples:

"The Olds Company, Burch Flat, Wenatchee, Washington, have fifteen acres of King David Trees four years old, which will average one box per tree;" or this, "H. S. Wetherald, Wenatchee, has ten acres of six year trees which will give 3500 boxes, or between five and six boxes per tree;" or this, "N. D.

Heath, Wenatchee, has 85 Jonathan trees, seven years old, which will average six boxes, while 85 Black Twigs will go ten boxes." Imagine seven-year old Baldwins in Massachusetts giving over three barrels per tree.

(3) Their trees bear more heavily and more regularly. I am not quite sure how much of this may be due to their better care, particularly in thinning, but I believe that it is in some part at least due to their long season, as referred to in the last paragraph, which allows the manufacturing plant of the tree to mature a big crop of fruit and still have enough surplus plant food to develop a fine set of fruit buds for the following year. In support of this general contention that their trees bear more, take the following: "Jack Lillis picked 2400 boxes from 143 Rome Beauty trees, besides 200 boxes on the ground. These trees occupy one and one-half acres of land, and the fruit will sell for $3000. Last year this acre and a half produced 1000 boxes which sold for $1860;" or take this, "Sterling Brothers, Wenatchee, will pick 3000 boxes from 504 trees nine years old. Last year the same trees gave 3000 boxes and the year before they gave a net return of $3000."

(4) There is a more general interest in the industry. I have already discussed this under my general impressions, but want to restate it here, as I believe it is a great factor in their success. I do not know how far it is possible or desirable to bring this about in New England, but it seems to me that such very promising sections as Colrain and Ashfield, in Massachusetts, for example, might profitably develop the orchard business till they could have warehouses and all the conveniences which go with a well developed industry.

(5) They have fewer pests than we have. This of course will tend to change as the orchard business develops; in fact, many pests are already noticeably on the increase. But with their vigorous treatment of these pests and with the dry growing season, which is so unfavorable to fungous growths, I do not believe they will ever have the same trouble from the ordinary, orthodox orchard pests that we do.

(6) Their virgin soils are better supplied with all the constituents needed by the tree for the production of choice fruits. This of course would not apply to orchards started on new lands

here, but the great bulk of our orchards are not put on such land, but on fields which have been long in cultivation.

The other factors which certainly contribute to the present lead of the western grower—but which we must pass by with a mere mention are:

(7) Their better laws, already discussed, and which I doubt if we are ever able to duplicate here because of lack of popular support.

(8) The tremendous development of co-operation, another thing which I fear we can never hope to duplicate here, or at least not for many years.

(9) The fact that their trees are all young, and are consequently bearing their very best fruit at the present time. This of course will "mend itself."

Turning now to the eastern side of the question, I am going to merely state what it seems to me are our advantages, because I have spoken of them so often before.

As I look at the situation our advantages are as follows:

(1) That we are close to our markets. I was told in Hood River that it cost them 89 cents a hundred to get their fruit to Chicago, and $1.00 to get it to New York. Two boxes are accepted by the railroads as the equivalent to 100 pounds. Mr. M. H. Shepard, the editor of "Better Fruit" says in the December number that it costs about 50 cents a box to grow the fruit. This makes $1 per box or nearly $3 per barrel which it costs them to land their fruit in New York or Boston. Certainly our New England orchardists can make money, and good money, at $3 per barrel in Boston, so that we are in a position to make orcharding pay, and pay well, on a price that would just cover expenses for the western grower.

(2) That our apples are better in quality than the western apples. Of course the westerners won't admit this, and even some easterners doubt it, but I cannot believe that the impression would be so general among consumers if it were not backed up by fact. I am not prepared to say that the western apple is not as good as the eastern apple when it is picked. Perhaps it is. Perhaps the long journey affects the quality. But I do believe that you would not find so many complaints of the lack of flavor in the western apples if there were not something in the charge. And I believe that the better prices the past two

years of the barrel fruit and the lower price of the box fruit means simply that the consumer is coming to realize that he gets quality here.

Now if I were pleading this case as a lawyer before a jury, I should be perfectly willing to rest my claim on these two points. If we can grow fruit of better quality and can market it at a good profit at prices which will only bring the western man out whole, what more do you want, if you are going into orcharding at all, to convince you that New England is the right place?

But there are certainly other advantages for the East. To keep up the scheme of numbering, these are:

(3) That land is cheaper with us, much cheaper. Good land can be bought for $25 an acre, or even less.

(4) It is easier to get labor. I cannot see how such isolated fruit valleys as Wenatchee are going to escape trouble on the labor problem.

(5) We have a better market for our poorer grades. I know we don't market them in the right way, and I know we have too many of this grade; and I know that our western friends, if I were to make that statement, would laugh at it, and say we were welcome to that advantage. But when I think of that big pile of beautiful apples which my friend Mike Horan showed me, I can't help feeling that a good market for it, if it were marketed in the right way, would be a valuable asset.

(6) We have better markets for our perishable fruit like berries and plums and peaches. Of course they do ship plums and even strawberries to eastern markets, but they are certainly handicapped more with these than with apples and pears.

In closing this list of our advantages, I want to mention two difficulties which it seems to me they face, and which cannot help acting as a drawback to the industry there, and consequently as a help to the eastern grower in the keener competition to which we must look forward. In the first place, I am sure that irrigation is going to bring increasing difficulties in its train. I believe this is one reason for the milder, poorer quality of the western apple. In the second place, their trees are planted very close together, and will soon need thinning. And beyond doubt many growers will not thin as soon as they

should, with the result that the quality of the fruit will be lowered.

And lastly, it seems to me that these well established sections are at the present time at the very height of their prosperity. Their orchards are young, giving the very best returns. I was told by the president of the Oregon State Board of Horticulture, a very enlightened man and a very fair minded man, that he considered they were now getting the cream off of their orchards, that he didn't see how it could be otherwise,—and I certainly do not. I asked him his opinion as to the relative advantages of the East and the West and whether if he were a young man here in the East he would go West to grow fruit. He said, "No, I consider there are just as good chances along the Connecticut River as here and if I were a young fellow in the East going into orcharding, I should certainly stick to New England."

Now, ladies and gentlemen, these are the points which I wished to bring out and it certainly seems to me, as I said in the beginning, that while there are many things that we may profitably learn from the westerner, we do not really need to be afraid of the western competition if we will take hold and grow such fruit as you people have here, and put it up in the way that the best of this fruit is put up; and I want to close by expressing my admiration for the exhibit of fruit you have here.

AN HOUR IN WONDERLAND.

Mrs. V. P. DeCoster, Buckfield, Maine.

When I was a small child I learned to believe in fairies and I still believe in them more and more. People may tell you that there are no such things as fairies, but you will find that I am telling you the truth, if you will go quietly to the fields and woods, brooks and pastures, and watch and listen patiently. But if you go whizzing through the country in an automobile or an electric car, you will never become acquainted with the fairies. They can be found on nearly every farm and in every forest in the State of Maine. They may not look just as some fairy books picture them, but they are just the nicest kinds of fairies imaginable, when you get acquainted with them.

A few weeks ago I discovered the headquarters of the fairies in our town. It was in a beautiful hemlock grove where the trees ran up tall and straight, and the ground was free from underbrush, carpeted with evergreen needles, and outlined in beautiful patterns with ferns, gold thread and partridge vines dotted with red berries. Away up in the tree tops an old grey squirrel keeps guard and warns the fairies of all intruders. The fairies had held a grand carnival the night before, for there were many tables and dancing pavilions, which looked like mushrooms. Some were round and smooth and flat, some of shades of pink and others of yellow and orange and brown. Some were shaped like open umbrellas, others were inverted, and others almost round. Many people eat mushrooms, but these which belong to the fairies in the woods are very likely to be poisonous, and it is never safe to eat even those gathered in the open pastures unless collected by an expert.

In this grove the fairies keep their pipes, which are often called Indian pipes, but I think they are fairies' pipes, because they are so pink and white and waxy.

Here also grows the coral root, with dainty orchid flowers and yellow jointed roots, from which the fairies make coral

necklaces. Along one edge of the grove dances a laughing brook. The banks are fringed with beautiful ferns while great trees lean over the water. There is one deep pool beside a huge boulder where the speckled trout and water babies live. On the edge of the brook grows the purple fringed orchis.

Farther down in the woods, the brook rushes over some great rocks, under which the larvae of the Dobson fly live. Fishermen call them hellgramites, and use them for bait when fishing for bass. The hobgoblins are ugly looking fellows, growing to be three inches or more in length, with a row of legs and gills on each side of the body. When fully grown they crawl into the bank, and in about a month come forth a large winged insect with a wing expanse of four or five inches. The males have fierce looking mandibles which strike fear to the hearts of small fairies.

On still pools in the brook are black water striders, looking like long legged spiders. These skim about over the water, occasionally jumping into the air to catch some small insect.

Where the brook enters the meadow are many beautiful flowers. Here the fairies get their foot-wear from the early pink ladies' slipper. A little later blooms the yellow moccasin flower, and the last of June, the great showy ladies' slipper.

In the grasses grow the dainty orchids, called ladies' tresses, which look like fairies' curling locks. Here, too, are the wonderful pitcher plants. I have brought you some of the leaves so that some of you teachers or scholars can take them to school tomorrow to show to those who are not here tonight.

Along the edge of the woods grow the early hepaticas from which the fairies get their white fur hoods. Here, too, are the may flowers, spring-beauties, trillium, ground-nuts, yellow violets and Dutchmen's breeches. Though why the flower books should give such pretty flowers such ugly names, I cannot understand. They might as well be called fairies' bloomers.

The thick white flowers of the turtle head grow along the brook and the leaves furnish food for the larvae of that rare and beautiful Baltimore butterfly. Fairies are evidently fond of kitties, for they have many pussy willows and alder catkins. Occasionally one sees a dainty, light green, lacy winged insect, called golden-eyes. These are very useful fairies, as their larvae destroy plant lice. They fasten their tiny green eggs

on the top of stiff white hairs, nearly half an inch tall. I have seen them on all sorts of things, such as apples, cucumbers, and cabbages, and once on a screen door.

Just as soon as the ice is melted in the brooks and marshes the fairies start their band concerts. First are the pipers or Pickering tree frogs, then the deeper bass of the bull frogs, and in the soft, warm nights of May, the love songs of the toads. It hardly seems possible, that so ugly looking a fairy could have so sweet a voice. Yet Hamilton Gibson in "Sharp Eyes," says, "It is to me the sweetest sound in Nature." Those warm moonlight nights, ushered in at sunset by the songs of the hermit thrush and veery, followed by the sweet thrilling love songs of the toads and the plaintive call of the whippoorwill, are the pleasantest nights of the year. I listen and listen and fight away sleep as long as I can.

For a few days the last of June, if one is near a lake he will sometimes see about sunset clouds of may-flies in the air. These are delicate greenish-yellow insects, with a wing expanse of nearly two inches, and two or three long thread-like organs from the end of the body. Their first life stage is in the water where they crawl about in the mud as little black creatures, with a row of legs and gills on both sides of the body. From these, hatch these beautiful winged fairies, which only live long enough to mate and drop their eggs back into the water for another generation. Last June I saw them at Wayne pond flying in clouds like great snow flakes, while the beach was lined with the empty skins of the nymphs. The dragon-fly or devil's darning needle has a similar life history. When I was a child I used to believe that they would sew up my mouth if I told a lie. That is why I grew up so truthful, and now feel obliged to tell the children that they are not only harmless, but are one of the good fairies, as they live chiefly on mosquitoes and other small insects.

The white faced hornets are good fairies also, for they live on flies, slugs, and many other injurious insects, so boys should be taught that when they burn a hornets' nest, they are injuring good friends.

Bumble-bees which live in the deserted nests of field mice, are of great value in fertilizing flowers. They are the only bees which have a tongue long enough to reach into the honey

tubes of the red clover. Some years ago, I knew of two little brothers who got some honey out of a bumble bees' nest. The older boy cautioned the little one not to go there alone. But a day or two later, the little boy's desire for honey made him disregard the caution, and he came to the house crying bitterly, and told his mother,—"I went down to the bumble bees' nest to get some honey, but the old bee was on."

There are many kinds of bees but none so valuable as the honey bee. People generally think only of the honey which the bees gather for us. But if the bees were destroyed we should lose nearly all of our apples, plums, pears, cherries and small fruits, besides melons, squashes, cucumbers and three-fourths of our flowers.

Farmers who wish to raise fruit should not depend wholly on wild bees. Mr. DeCoster tried an experiment one year by enclosing one branch of an apple tree in netting just before blossoming. Although that branch bloomed just as freely as the rest, it bore scarcely any fruit, while the rest of the tree was loaded. What few apples grew on that branch must have been fertilized by the wind. The wind carries the pollen for such blossoms as the catkins of the alders and poplars and for the cone bearing trees as well as many of the deciduous trees. By the way, do you know how interesting our trees can be in winter? A few winters ago I sent here to Augusta for Edgar E. Ring's little booklet on the "Forest Trees of Maine." It is very interesting to learn the kinds of buds and bark and arrangement of branches. It makes the trees fully as interesting as in summer; and at the same time gives you a chance to study the winter birds and animals. I know many of you orchardists can tell the variety of apple trees in winter, by the size and manner of growth of the branches, buds and bark.

Life in the country is beautiful to the Nature lover at any season of the year. If our boys and girls once learn to love these little fairies in our wonderland, and can realize the power man has to utilize the mighty forces of Nature in getting a living from the soil, we should not need to ask how to keep them on the farm.

Now I have brought a few things here which I wish the children especially to see. I see you all know Robin Red-

breast as soon as you see him. Of course Robin is one of our best fairies.

Here is one of our common winter birds, the Snow Bunting. You will see these in flocks round on the weeds. That is one of our fairies.

But here is one of the hobgoblins, a pretty bird, but he is one of the enemies of the other birds. This is called the shrike or butcher bird. This is one of our winter birds also, but he is a very cruel bird. He has a cruel, ugly bill like the hawk, and lives on small animals and insects. He kills a great many large grasshoppers as well as field mice, and other little birds. You people who live in the country have probably seen quite often mice hung up on trees. Sometimes they are hung in the crotches of branches with their head caught in the crotch, and no doubt you have wondered how a mouse could ever get up into a tree. Well, it is the work of the shrike or butcher bird. He will kill a great many more mice and little birds than he can eat and uses the trees for cold storage plants and hangs them up around till he gets ready to eat them. Sometimes he eats them, sometimes he doesn't.

Here is one of the dearest birds that we have. It is not a very common bird but it is an especially pretty one and one of our sweetest singers. This is the Rose-breasted Grosbeak, a very sweet singer. It resembles the oriole. They are not nearly as plenty as I wish they were.

This is one of our dear little winter birds, the Chickadee. Nearly everybody knows the Black-capped Chickadee, which has such a cheerful little cheep in the winter. You all know the notes chickadee-dee-dee, but not every one knows that it also has two other songs. It has one sweet little call of two notes which very much resembles the song of the Phoebe, only a little fainter and sweeter.

Now we have one of our most cheerful spring birds. I think most of you can see the red and yellow epaulette on its shoulder, —the Red-winged Blackbird. A peculiarity about these birds is that the male birds come first; although they are very devoted husbands after they are once married and never flirt with any other women, yet they come ahead and leave the girls to tag along behind. They live, after they decide where to build, in wet places along the brooks and ponds, but when they first

come they seem to hold conventions on higher land. The most of their notes are harsh, but if you can get near one of those conventions, once in a while you will hear one of the most liquid, sweetest notes there is in the bird world.

Now here is a bird which I hardly know whether to call a fairy or a hobgoblin,—the bluejay. You know we have this bird the year round. Well, the bluejay is generally considered a hobgoblin. People say that he is very cruel and that he kills other little birds, but those who have studied him the most say that he is a good friend to us because he eats a great many of the injurious insects. A few years ago I was having a lesson on birds with a little nature class and I told the boys to find out what they could before the next lesson about the bluejay, and one boy told me that there were some bluejays in his father's orchard and his father said that they were eating buds from the apple trees and told him to take his gun and go out and shoot the jays. Well, he took the gun and went out there, but he sat down to study the bird and get near to it—that was several years ago when we had a great many tent caterpillars—and he found the bird was twisting off the eggs of the tent caterpillar laid in clusters on the little branches The bluejay was making a good square dinner out of the tent caterpillars' eggs, and he didn't shoot the bird.

The next is one of our best friends, a bird with a very long tail, the Black-billed Cuckoo. This is one of the birds that will eat a hairy caterpillar. There are not many that will. The most of them will eat the big, juicy fat ones, but this will eat all kinds, even the tent caterpillar. Last year I found a nest of one in an apple tree, very near one of my cages where I keep some of my choicest caterpillars. Well, I loved the bird and I loved the caterpillars and so I didn't know what to do. I climbed up and looked into the nest but I didn't hurt the bird, but she resented that so much that she changed her nest, just because I had looked at it. I thought it was very unkind in her, but still I didn't feel very bad to think she went somewhere else.

This is not a very common bird in Maine. I am told it is quite common in Connecticut. But once in a while we see it, as it migrates through here. It is the Scarlet Tanager, with bright wings and tail and a bright red body. I suppose, being so

bright, it is a target for boys with guns who don't realize that they are shooting one of their best friends.

Here is a little tiny bird, which is one of the birds I love the most,—the Chestnut-sided Warbler. Like some women it is always happy and cheerful, darting around and doing the hard work. It really has very pretty colors, chestnut and yellow and black, and it has a very sweet song.

Now here is a bird that all the boys and girls near enough to see the colors will say is a bluebird. It certainly is a very pretty blue bird, but it is not what we call the bluebird. Our real home bluebird that comes near the buildings and builds in the old apple trees has a reddish breast. This is bright blue all over. We call this the Indigo bird. It is rather a shy bird and is not seen very often, but when you do see it, it is flying along through the bushes out of sight of the road, and the male at mating season has a very sweet song.

I have now a peculiar bird, that is, in some ways. Any one who knows the thrush family will see the thrush streaks on its breast and the crown of its head. It is called the Golden-crowned Thrush, sometimes the teacher bird. The male bird has a beautiful song that very few people know, but you generally hear it by the notes of "teacher." It begins very low and keeps going a little higher each time. It builds its nest in the woods in the dry leaves. Sometimes you see the leaves in a little mound as though some plant were growing up and pushing the leaves. You find a little hole in one side—they say it is the shape of a dutch oven, and inside is the cosy little nest of the teacher bird.

Next is one of our home birds, the red-eyed vireo. It is not very common. It is known by its slate-colored cap and the olive colored back and light breast.

Now comes one of our tiniest little winter birds, almost as small as the Home bird, with a bright yellow cap, edged with black. This is a winter bird and the colder it is the happier this little bird seems to be. It isn't still a minute, when you see it it is darting around among the trees. This is called the Golden-crowned Kinglet.

This is one of our common friends, although he does not look natural a bit. When you see him he is generally just

sailing over the trees with his wings spread out, singing bobolink as sweet as can be.

Here is what we call the Purple Finch, sometimes the Red Linnet. It is a very sweet singer.

Here is another bird of almost exactly the same colors and the same shaped bill. This is a Canadian bird that we have with us along in the winter, and very many people will tell you most confidently that they saw a flock of robins yesterday. You will say it couldn't have been. But I have heard people stick to it that they saw robins because they caught a glimpse of these red birds. Only the males have this red color, but they are also red on the back. It is a sort of a strawberry or raspberry red. And you see the bird is almost as large as the robin, although it has a shorter, thicker bill. This is called the Pine Grosbeak. One peculiarity about it, is that you will seldom see more than one male in a flock and sometimes not that, and the females are all dull slate color. The females are very tame and not very attractive looking birds. They eat a great many different kinds of buds in the winter, especially, as the name would imply, among the pine seeds and cones. I have seen them come within a few feet of the house into the maple trees and in an orchard where there are frozen apples hanging on the limbs they will pick the apples open to get at the seeds.

Now these are only just a few of our commonest fairies. I have here fairies of another kind. A great many of you people have read Mrs. Gene Stratton Porter's book, "The Girl of the Limberlost," and in that she has made the Yellow Emperor famous. This is the Yellow Emperor that she speaks of. The young lady had a dress made like it to wear to a ball and as the ball began, through an open window one of these great moths fluttered in, so that the people could see the resemblance between the moth and the dress. All the moths are not as large as that. This came from St. Louis, but they are raised even as far north as Portland, and Professor Hitchings says he has raised them in Massachusetts.

Here are some of our commonest fairies that are with us every night every spring, more or less, after the middle of May through June in warm evenings. The Cecropia moth is very common and yet there are very few people who see it.

You probably see it fluttering around at dusk. This is made up in what we call a life history. I wish we could have these life histories in every school in the State. Children are so interested if they see anything of this sort. to hear the name. Now those people who have read "Freckles" by the same author as the Girl of the Limberlost—Freckles was a boy and that was a nickname for him—remember where she tells about Freckles seeing the Luna moth hatch. He watched that moth come out of the cocoon and he was consumed with a desire to know what that wonderful thing was. He could not express his feelings, because he wanted to know what it was, what the name of it was, how long it would live, and what it would amount to. And children as a rule have that same feeling about these things. If they see them once they want to know the name. Now children will often bring in caterpillars to their parents. Ninety-nine women out of a hundred, and men too, are afraid of caterpillars. and if a child brings one in they tell him to carry that ugly thing out and kill it. They think everything that is a caterpillar is dangerous, whereas there are only two kinds of caterpillars in this State that are dangerous. I guess you all know the brown-tail by this time, you know it is dangerous, and yet I don't believe that half of the people who clean the caterpillars off of their trees can pick out a brown-tail caterpillar if it is put in with a lot of other hairy ones. You know it is brown-haired but very few people can tell just what it is. Here is a life history of the Cecropia moth; the eggs on a branch, the caterpillar into which the egg grows, the cocoon which the caterpillar spins when it gets its full growth and stays in through the winter. Now these cocoons are very common. Here are some just as they are found on branches. Well, half of the people that fight those think they are brown-tail moth nests, and yet when you come to really look at them you can see there is a great difference. These caterpillars spin their cocoons onto the branches and they hang there all winter. Any one finding one of those, if he picks it and takes it into the house will see beautiful moths hatch in the spring. I presume thousands are burned up every year. I brought quite a number of these here that I would like to give to the teachers if there are any that would like to have them, at the end of the meeting, and also a few of the luna cocoons.

Here is the life history of the luna. This is one of our commonest moths and to me it is the most beautiful, it is so dainty. Just taking these luna cocoons in my hand has disturbed the pupae and they are rolling over and over and over inside. It is very interesting to watch them hatch. The cocoons do not hang onto the branch like the Cecropia, but the caterpillar when it gets its growth comes down under the trees and spins the cocoon down among the dry leaves and grass. And it has a peculiar way of getting out. I have read a great many things about the luna and I have watched a great many of them hatch but I never learned until this year how they got out. The silk is very tough and we wondered how they got out of that silk until one day this summer one of the girls said "I am going to find out how that luna gets out of its cocoon," and she held it in her hands and watched it closely. As the hole began to show and it stuck out its antennæ and got out she found on the shoulders as we would call it, right where the wings join the body, two little tiny hooks as sharp as needles and not more than an eighth of an inch long, and as he kept working his shoulders these little hooks kept tearing the silk threads, and that was the noise we heard. He tore these little silken threads till he got the hole big enough to come out. But he had not been out five minutes when you could not see the hooks. As the down dried out and fluffed over his body it covered those, and I suppose that is the reason we never saw them, because they only showed when the moth was wet.

Here is the polyphemus, the brown one, very common among us, as common as the others, and the caterpillar looks so much like the luna that you have some difficulty in telling them apart unless you look at the head. The polyphemus has a brown head and the luna a green one. The cocoon of the polyphemus is white and that of the luna is green. These moths are very easy to raise. If you can get a female that has not laid her eggs and can keep the eggs, you can raise the caterpillars very easily. I have raised as many as two thousand lunas in one year by pasturing them out as Proessor Hitchings told me to do. Instead of keeping them in cages at the house and feeding them on leaves, you can make cages of surgeon's gauze or cheese cloth as we call it. We sometimes take mosquito netting, and make large bags. Tie the bag right over the end of a

branch of the food plant of the caterpillars. The lunas feed almost entirely on gray birches, the polyphemus and cecropias also feed on those but they will feed on others—the cecropias will feed on almost any kind of a fruit tree. Then put these little caterpillars or the eggs in there and let them feed on those leaves until the leaves are nearly all eaten; then you can transfer them to some other branch. It takes them only about six weeks to grow, so that you can raise a great many in a short time. There is one very interesting way to catch the male moths. If you can find a cocoon and hatch a female moth, then put her in a wire cage and set it near an open window, and leave the window open all night if you don't want to sit up all night and watch them. We tried it one night with the polyphemus. I read in a book somewhere of a man that caught twenty-seven in one night and I thought that was an almost improbable story. But two years ago we tried that one night and we had sixty-five the next morning, by actual count, of these great moths all over the room. And about that same time in one night we caught twenty-four of the lunas. I don't want you to think we killed them all by wholesale because we only saved a few of the best and let the rest go.

Here is an arrangement that we call a nature picture,—insects arranged with grasses and flowers so as to make it look a little more natural as if they were flying around. A good many people keep their insects on pins but somehow there is a rather unpleasant feeling about that. Sometimes we make them up in large pictures in a common picture frame, perhaps a yard square. You can make beautiful pictures that way and make them look quite natural. If we could only have the life histories of these common insects especially, in our rural schools, so the children could learn these, it would be of the greatest value. Now children will hear you tell about these brown-tails and about their being poisonous, but they don't know about them. At our Pomological meeting at Waterville, I think, two or three years ago, I was talking with the school children there and one little girl told me that some one told her if a brown-tail moth bit her she would die and that girl was living in daily fear. She didn't know what a brown-tail was, and didn't know that a moth couldn't bite any way, and there she was living in fear that if that moth bit her she would die.

They ought to be told things a little plainer, and some of our men ought to be told too. If the brown-tails are as thick all over the State as they are in Oxford County, I pity you Augusta people who have got to clean these trees this winter, for if they are not cleaned how are you to live next summer.

I think I have shown you all you can see here in the evening. If we can only awaken a little interest among the children—and grown people too—if we can only get an object that will give us something to think about we won't grow so narrow-minded. Men and women ought to find some kind of interest beyond their work, something that will be a rest to them outside their work. I expect people think I am a crank and pity my poor husband because I carry it so far, but somebody has got to interest the others. And when you do get interested in nature it opens such a broad field. If our boys and girls can get interested in these things and get some faint idea of the wonderful possibilities of earning a living out of the soil and of raising such fruit as this we won't have to ask how to keep them on the farm.

ANNUAL BUSINESS MEETING, THURSDAY MORNING, NOV. 16, 1911.

Meeting called to order by President Twitchell. E. L. White gave his report as Secretary as follows:

During the year there have been three meetings of the Executive Committee held.

The first was in Auburn January ninth. The premium list was revised and other business relating to the year's work was transacted.

The second meeting was held in Augusta February eighth. Matters that were before the Legislature were discussed and acted upon.

The third meeting was held in Greene August twenty-third at the home of Vice President H. L. Keyser. The program and other matters relative to the annual meeting were discussed.

One field meeting has been held during the year. Mr. H. L. Keyser invited the Society to meet with him on August twenty-third. A large number gathered to see the practical side of raising fruit. His orchards gave a number of different lessons in cultivation and spraying. The meeting was considered a fine success.

During the year a Federation of Agricultural Societies has been formed. Our Society is entitled to representation according to our membership. Our Society has been represented at the meetings held by the Federation.

The membership of the Pomological Society now numbers a little over two hundred. The list of life members has been revised during the year.

It was my pleasure in February to be present at the winter meeting of the Connecticut Pomological Society. The fruit display was a good one for the time of year but my attention was especially attracted to the large list of annual members. It was secured by the efforts of a committee assisted by each member of the Society. There were, I think, five hundred

members. Such a large membership scattered over the State must be an incentive to increased interest in the work of the Society.

The interest in fruit growing in our State is certainly on the increase as the Reports of the Society have been in greater demand than last year and could our membership be doubled the good work being done by our Society in the interest of fruit growing and marketing would become better understood and more appreciated.

Respectfully submitted,

E. L. WHITE.

Voted, that this report be accepted and placed on file.

The report of the treasurer, Mr. E. L. Lincoln, was then presented as follows:

REPORT OF TREASURER.

Ellis L. Lincoln, Treasurer, in account with the Maine State Pomological Society for the year 1911.

RECEIPTS.

Cash on hand from the year 1910	$176 49
January 1, interest on Stock First National Bank, Farmington	12 00
January 1, interest on Bonds, First Mortgage	22 50
July 1, interest on Stock First National Bank	12 00
July 1, interest on Bonds, First Mortgage	22 50
February 9, received from State balance on Stipend for year 1910	74 27
December 2, received from Savings Bank, interest	41 46
December 2, received from Secretary for space in hall	10 00
December 2, Life Membership fee, 1911	70 00
December 2, Annual Membership fee, 1911	54 00
January 22, received from State Stipend for year 1911	764 30
February 15, 1912, received balance of State Stipend for year 1911	235 70
Total Receipts	$1,495 22

EXPENDITURES.

February 21,	Paid Will E. Leland	$11 00
March 6,	Transfer to Permanent Fund	120 00
June 12,	Paid Knowlton & McLeary Co.	5 00
September 7,	Paid E. F. Mason	1 50
	Maine State Bookbinding Co.	28 75
	W. E. Leland	5 20
	G. M. Twitchell	5 00
	E. F. Hitchings	5 12
	Maine Farmer	3 50
December 4,	Paid Loring, Short & Harmon	2 05
	Brunswick Publishing Company	2 50
	G. A. Drew	33 80
	George T. Powell	63 60
	F. C. Sears	48 62
	H. F. Hall	35 90
	J. B. Castner	21 60
	M. C. R. R. Freight	2 40
	A. A. Marshall	2 28
	Maine Farmer Publishing Company	3 75
	Board of Trade Journal	4 00
	Burleigh & Flynt	33 60
	Premiums	380 50
	Augusta House	87 80
December 4,	Paid E. L. Lincoln	4 50
	E. L. Lincoln	5 00
	E. L. Lincoln	25 00
	G. M. Twitchell	5 95
	C. F. Fletcher	18 64
	E. L. White	150 00
	E. L. White	46 33
December 30,	Paid Mrs. Eva M. Black	3 00
	E. F. Hitchings	3 20
	Burleigh & Flynt	14 30
	M. C. R. R. Freight	2 52
	Mrs. V. P. DeCoster	15 00
	John C. Woodrow	3 75
	F. H. Morse	5 35
	F. H. Morse	12 46
	Transfer to Permanent Fund	70 00
	Error in premium	1 50
	Swift & Turner Company	2 10
	W. V. Hunt & Company	7 50
	L. B. Raynes	53 45
	E. L. White	4 89
	W. W. Bonns	1 10
Total Expenditures		$1,363 01
Cash on hand		132 21
		$1,495 22

PERMANENT FUND FOR THE YEAR 1911.

December 30, By members as reported for the year 1910....	$1,910 00
Fees received for the year 1911	70 00
	$1,980 00

PERMANENT FUND INVESTED AS FOLLOWS.

Four shares stock First National Bank, Farmington.....	$400 00
Two bonds Stockton Springs Water Co., First Mortgage....	970 00
Deposit in Savings Banks	610 00
	$1,980 00

Respectfully submitted,
ELLIS L. LINCOLN, *Treasurer.*

Voted, that this report be accepted and placed on file.

The president then appointed Dr. J. W. Bowers, Mr. J. W. True and Mr. T. M Lombard a committee to receive, sort and count votes, and the following officers were elected for the ensuing year: President, Howard L. Keyser, Greene; first vice president, W. H. Conant, Buckfield; second vice president, A. K. Gardner, Augusta; secretary, Edward L. White, Bowdoinham; treasurer, E. L. Lincoln, Wayne; member of executive committee for three years, F. H. Morse, Waterford; member of Experiment Station Council, R. H. Gardiner, Gardiner; representative to New England Fruit Show, Homer N. Chase, Auburn.

Voted, that the election of the trustees be left with the incoming executive committee.

Voted, that the invitation from the Board of Trade and Mayor of Portland be referred to the executive committee.

Voted, that the Society extend an invitation to the New England Fruit Show to meet with us at our next annual meeting.

The committee on resolutions reported as follows:

Resolved, That the members of the Maine State Pomological Society hereby extend to the Augusta Board of Trade their sincere thanks for the cordial invitation to hold our annual meeting in the city of Augusta. We also recognize, with thanks, the efficient service rendered by its special committee in working up an interest in the meeting and exhibition.

Resolved, That our thanks are hereby extended to the citizens of Augusta and the Kennebec Valley for the generous hospitality given to the Society; also for the liberal special prizes they have given to encourage Maine fruit growers to exhibit the products of their orchards.

Resolved, That our thanks are extended to the Maine Central Railroad and Grand Trunk Railroad for excursion rates over their lines.

Resolved, That we are under special obligations to the local press for the wide spread publicity they have given the meetings and for the extended reports they have given of its transactions. We would also extend to the Maine press at large our thanks for similar courtesies.

Resolved, That we regret to note the absence of any exhibit of fruit from the State Farm at Monmouth at the New England Fruit Show, Portland Exhibition and our own exhibition here.

Resolved, That the members of the society hereby express their thanks to our officers for the efficient services they have rendered the fruit interests of the State.

For the committee,
D. H. KNOWLTON, *Chairman.*

Voted, that the report be accepted.

Voted, that a committee be appointed to take under consideration the matter of the Maine Fruit Farm. The president appointed John W. True, New Gloucester, F. H. Morse, Waterford and Stanley Bisbee, Rumford Falls.

W. H. Conant read the report of the committee on the president's address, as follows:

To the Officers and Members of the Maine State Pomological Society:

Your committee appointed to consider the annual address of the president respectfully submit the following report:

1st. We heartily approve of the recommendations embodied in the address.

2nd. We move that a committee be appointed to devise means for carrying these recommendations into effect, said committee to submit its plans to the next annual meeting of this Society.

R. T. PATTEN, Skowhegan,
W. H. CONANT, Buckfield,
V. P. DeCOSTER, Buckfield.

Voted, that the report be accepted. The following were appointed a committee as recommended in said report: R. T. Patten, Skowhegan; W. H. Conant. Buckfield, E. F. Hitchings, Orono.

Voted, that in view of the efficiency with which our outgoing president has managed the affairs of this Society, we extend to him our thanks and appreciation by giving him a rising vote, which was accordingly done.

Adjourned.

DR. TWITCHELL: We have with us the old Secretary of the State Pomological Society, a man who has served the society well and faithfully for years, a man who is interested in pomology and a man who did an infinite amount of work in building up the society and keeping up the interest during all the years that he served it. I know we would like to hear from Mr. Knowlton.

MR. KNOWLTON: *Mr. President and Gentlemen:*—I am exceedingly glad to be here with you and to know of the increasing interest in the affairs of the society. I feel especially grateful for this, because years ago the society was struggling to make itself felt in the State. At the present time we have evidence that it has been growing all these years, and I think we may now recognize as a matter of congratulation that its influence in the State is greater and far more important than it ever was before. This influence has only begun, for the work in the future is to be far greater than the work in the past has been.

There are certain measures which are pressing hard upon the fruit growers of the State. One is the importance of providing in some way for some general storage of our fruit. We do not quite realize that when we sell a barrel or a carload of fruit at the present time it goes to some city and is held in storage until it is ready for the consumer. Sometimes that extends over several months,—in the case of the late keeping varieties four, five or six months, and storage in the city of London or in the city of New York, or Boston, costs a good deal. The farmers do not realize that the cost of that storage must in some way come out of what the fruit is actually worth. In other words, the farmer who produces the fruit has to pay for that storage. What we need throughout the State is some system of inexpensive storage by which the fruit of the State may be held economically until it is wanted for market.

The importance of marketing the fruit is so great that this is a question that we should talk over, it seems to me, and consider at every meeting of the society, hoping that eventually some plan will be formulated which will be feasible and helpful to the fruit growers in selling to the best possible advantage their fruit.

I thank you very much for the opportunity of saying these few words to you.

DR. TWITCHELL: It gives me pleasure at this time to present an old friend and co-worker in the agricultural field, one with whom I have traveled many miles and spent many days during the past twenty-five years, one whose devotion to agriculture has not been excelled by any one in the Dominion of Canada and who now is Secretary of the Department of Agriculture at Fredericton and has come over to see Maine fruit and a little of what Maine is doing along these lines. It gives me pleasure to present to you Hon. W. W. Hubbard, of Fredericton, N. B.

MR. HUBBARD: *Mr. President, Ladies and Gentlemen:*—I notice that your program is full of good things and therefore it would not be wisdom on my part to attempt to trespass on your time. I can only say that it gives me a great deal of pleasure to be able to accept the kind invitation of my good friend, your President. We think a great deal of Dr. Twitchell over in the province of New Brunswick where we have been favored with his presence and his teaching ability in years past. I am very glad indeed to be able to see what you are doing in apple growing. Your soil and climate here are very similar to what we have in the province of New Brunswick, your nearest neighbor to the east. One people as we are very largely, with common aspirations and hopes, working out our salvation as best we can in the development of our respective countries, I am sure we can only gain by friendly intercourse, and therefore I am very pleased indeed to meet so many good friends interested in agricultural and fruit growing development as I have had the pleasure of meeting here today. I must congratulate you very, very heartily indeed on the exhibit that you make here at this time. We had a little fruit show in St. John the other day that was perhaps larger in quantity but not any greater in variety, and in fact not so great in variety, for we are not, perhaps, growing the same number of varieties of apples successfully as you are here. We haven't begun to develop our fruit growing business in the province of New Brunswick to the same extent that you have. Just last year we appointed a horticulturist and began to take the subject up systematically. But we feel that we have a great opportunity to develop a very

large and lucrative business for the people of the country in the growing of some of the very best varieties of apples that are wanted on the markets of the world today. Of course when you get high quality of fruit it means high quality of men to grow it; it means great care; it means thorough, systematic work from the planting of the tree—the preparation of the ground I might say—right up until the apple is placed without flaw or blemish on the consumer's table, and we must work for the extra reward that we want every time. I came here to learn, and to see, and to meet you good people, not to talk to you, but I might perhaps throw out, as the President has suggested to me, a hint in regard to the value of co-operation among fruit growers for the purpose not only of growing fruit successfully, but more particularly of marketing it and getting the full value for it. The province of Nova Scotia, as perhaps some of you are aware, has for the last twenty-five years been one of the prominent fruit growing sections of the Dominion of Canada, but it is only within the last two years that the fruit growers there have taken up this matter of co-operative marketing. And this year I am glad to be able to tell you that while they have had a very much larger crop than they have ever had before to handle, they are moving it off to different foreign markets, to the Canadian Northwest, and getting more money out of it than they ever have in the past, and largely through their judicious system of co-operative handling and marketing. Somewhere between fifty and a hundred thousand barrels have gone to an entirely new market for Nova Scotia, through the co-operative societies, in the northwest provinces of Canada, this year. Some eight thousand barrels have already gone and perhaps as many more are contracted for, to the German market, a lot are going to Holland, and then of course the main body of the crop goes to Great Britain and is largely distributed through London, to which market so many of your nice apples go. I believe that no better work could engage the attention of your Association here. It has done good work in the past I know, and I must congratulate the officers of the Maine State Pomological Society for the grand good results they are getting from the work that they have been so patiently and persistently doing in the past years. I have watched what has been done here with a great deal of interest and am glad to see the

results of the labors of this pioneer association getting down now to a point where the people of the State must begin to recognize the value of such kind of work. I hope that the Legislature will extend very generous aid to the Association in the work that it is trying to do. It would be idle on my part to refer particularly to the exhibits here because I don't profess to be much of an expert in fruit myself. I have been watching very interestedly the little experiments that we have been trying to make throughout the province of New Brunswick in regard to the adaptability of varieties to different sections. I was glad to notice the many good points that your President mentioned in his annual address, and I was particularly impressed with the point that we must study and find out just how the soils, climatic conditions and other influences affect different varieties so that we may make the best of our local opportunities. That is a matter that is well worthy of investigation. We have just started on that in New Brunswick. We have some twenty-seven different stations planted out under the department over which I have the honor to be the deputy head, and our horticulturist has every tree numbered with a view to keeping a sort of diary of the doings of that tree from the time it is planted until it comes into bearing. We are asking the men who have these orchards on their farms to carefully keep the records and we hope that in the next ten or fifteen years we shall have a lot of valuable information from the apples in at least twenty-seven or twenty-eight different localities throughout the province, to be a guide as to what localities are likely to give the least danger of failure. And we also illustrate on these sample orchards the system of cultivation and care and fertilization that we believe to be the best for the different sections in which they are planted, so as to give an object lesson of what sort of success a man may hope to have in an orchard in that particular location by following out the lines of work and selecting the varieties that are doing best in these orchards. We also follow up as far as we can educational work in spraying. The past year we took three different orchards, old neglected orchards to some extent, in different parts of the province, and had our horticulturist demonstrate there proper pruning and spraying and fertilizing and harvesting and marketing of the crops. And of course this year was a very favorable year for

getting good results from good work, and we were very much pleased with the results that we got from those demonstrations. And in general I find that the interest that we are taking as a province in promoting the growing of apples is having a very great effect in calling people's attention to the fact that we can produce such dessert apples as the McIntosh Red and the Fameuse, or the Snow apple, and a few other apples of high quality like that. We can produce these just as well as, and we think a little better than almost any other part of the world; and by putting these in an experimental way on some of the markets and calling attention to what we can do, the result is that we are beginning to attract the attention of people who have money to invest in fruit growing, and we hope in that way to develop very much more rapidly than if we depended on the farmers who are making simply a side line of orchard growing.

I can only say again, I thank you very much indeed for giving me the opportunity to say a few words, and that I hope, situated as we are here with an invisible line between us, that we will continue to live with the very best of friendly feeling between the two countries. You have your political ideas and are developing in your own way; we on our side have ours, and you will pardon us if we prefer to keep to our way of developing. I think that we have abundance of room to build up a large and prosperous nation, an integral portion of the British Empire, right here in close proximity to you, and I hope that the existence of these two peoples on the North American continent will be for their mutual benefit and mutual advancement.

TWO YEARS' WORK AT HIGHMOOR.

By W. W. BONNS, Horticulturist, Maine Agricultural Experiment Station.

Mr. President, Ladies and Gentlemen:

In the year 1909 the legislature of this State appropriated the sum of $10,000 for the purchase of a farm whereon the Maine Agricultural Experiment Station could conduct experiments in orcharding and other agricultural pursuits. Some time later in that year Highmoor Farm was selected for the purpose by a duly appointed committee, but actual possession was not obtained until late in the summer of 1909. There was indeed little that could be done that year in the way of agricultural operations; fertilizer was applied in small amount in the orchards, the trees were sprayed once during the summer with bordeaux mixture and in September they were subjected to their first regular pruning.

Orchard renovation, therefore, in its real meaning, comprising as it does the care of the plantation throughout the entire season, did not really begin until the spring of 1910. The results of the work since that time have been gratifying to those who have been connected therewith and not without significance, we hope, to Maine orchardists in general and to the members of this Society in particular.

The interest of this organization centers chiefly, if not wholly, in the production of fruit; for that reason I shall omit all discussion of the experimental work at Highmoor Farm involving other crops, some of which come wholly or partially within the domain of horticulture. You are interested, I take it, in hearing about apples. It is, therefore, of apples that I purpose to speak.

Let us return to the summer of 1909, when the speaker first came to Highmoor. A sorrier lot of trees it has rarely, if ever, been his misfortune to see in any planting that aspired to the name of orchard.

The total number of living trees was close to 3200. These, planted so far as we have been able to learn about 25 to 28 years ago, were well advanced on the road to death from injury and starvation; indeed some were already so far gone that they have since been mercifully relieved of a useless existence, and turned to good account as fire wood.

In size these 28 years old trees resembled normal 10 and 15 years old ones, so slow had been their wood growth. The foliage was of the pale yellow-green color so characteristic of vegetation in an abnormal condition. The tops were a tangled mass of intertwined branches and twigs. Limbs were overgrown with lichens and mosses. Foliage was peppered with the leaf spots of numerous fungus parasites. Apple insects of nearly every kind common to this region here found congenial abode, and were rearing their generations to be counted as individuals in the tens of thousands.

Nor was parasitic life the only factor that had been at the work of destruction and devitalization. All the orchards had for years been under a thick sod of the toughest witch grass, which, besides exhausting the soil of the moisture so necessary for tree development, harbored great numbers of field mice. These in turn wrought havoc in the orchard in the winter months, taking their toll of the youngest trees, in the earlier days, and inflicting serious damage on those of greater age. In addition, several orchard fires of more than ordinary severity had run through the grass during the four or five years previous to 1909, inflicting very marked injuries to trunks and roots.

This, in brief, was the legacy of the horticultural division of the Station from the preceding owners of the farm. Here was a typical neglected orchard. Could it be successfully renovated? Could it be made to pay? Here was a problem which, if not abstractly scientific, was of direct and vital import to the fruit growers of this State. We have not yet come to the final word, but we have some results to submit that should be of interest.

As aforesaid, the trees were sprayed once in the season of 1909—the first part of June with bordeaux mixture of the 4-4-50 formula, with three pounds of lead arsenate added. The insecticide was successful in checking insect depredation, although the most telling injury had been effected before the

Station took charge. In regard to fungus control, the bordeaux was doubtless no less effective. But here, also, too much damage had been done before the application. The foliage, moreover, sapped of its vitality by lack of plant food and already injured by insects and fungi, exhibited a characteristic injury that bordeaux very frequently produces under the conditions just mentioned.

About the last of June the trees received a moderate application of chemical fertilizer, containing the three necessary elements, nitrogen, phosphorus and potash, and especially rich in the first named. 300 pounds were applied to the acre. Apparently the witch grass received all the benefit of this, judging by its thrifty condition when the speaker arrived in September of that year. The trees had to all appearances profited nothing.

That fall all the trees received their first pruning. The immense amount of tangled growth that formed the tops of the trees made necessary a plan of pruning somewhat different from that which one would conduct in an orchard in thrifty condition. Had all the wood been removed that season that was necessary for the proper shaping and thinning out of the orchard, the result would have been a stimulus to wood growth that would doubtless have delayed the production of fruit for several years. It was, therefore, decided to extend over a period of three years the pruning that might properly be done at that time, thus gradually shaping the trees to the desired heads and at the same time allowing greater opportunities for the formation of fruit-buds by avoiding undue vegetative stimulus.

No trees in any number were removed in this first season. It was desirable to see what response even the greatest cripples would make to one season of thorough care.

The keynote of the campaign of 1910 was cultivation, and this was begun as early as the ground could be worked. All the orchards on the farm, except certain experimental plots, to be discussed later, were put under the plow. The thick sod of witch grass, tough as a carpet, was finally well subdued by the plow followed by the cutaway and spring-tooth harrows. Cultivation was as continuous as the conditions of the season demanded, a fine soil mulch being maintained and the weeds kept down until the end of July, when cultivation ceased. A cover crop of rye was sown in one orchard, winter vetch in another,

and in the largest Ben Davis planting the weeds were now allowed to come up for the purposes of winter cover.

During the season the trees were sprayed three times at the proper intervals and periods: when the blossom buds showed pink at the tips; immediately after the petals fell; and from ten days to two weeks later. With the exception of some experimental plots, where the sulphur sprays with lead arsenate were used in comparison with bordeaux and with unsprayed trees, bordeaux mixture was the fungicide used in all the orchards, combined with lead arsenate for insect control. The results of the spraying experiment, reported at your meeting last year, need not be dwelt upon in detail at this time.

We have said that all the orchards were put under the plow. This is true if we except three plots of about 1 1-4 acres each, one of which was pastured to sheep, one to hogs, and the third left in grass just as the Station found it. With the exception of these three plots and of two others of about equal area, of which we shall speak presently, all orchards received high-grade, chemical fertilizer at the rate of 1500 pounds per acre.

Of the two other plots just referred to, one was treated with eleven loads of stable manure, to be compared with its neighbor, treated with a complete chemical fertilizer at the rate before mentioned. The object of this was a study of purely organic versus purely chemical fertilizer for apples. This experiment is to run for a series of years and the results are not yet definite enough to make deductions therefrom.

The results of this year were evident. They were not expressed in terms of a large crop but in marked evidence of response to treatment, with good prospect of fruit production in the near future. At this time one could determine with practical certainty which of the trees were beyond hope of redemption at any reasonable cost, and these were removed. In number they totaled about 500, so that at present there are about 2500 trees at Highmoor, although not all of them of size sufficient to bear much fruit.

The greater portion of the season's crop was picked from the Ben Davis orchard, used for the specific experimental work. The trees sprayed with the lime-sulphur preparations produced excellent apples—large, well colored, free from parasitic injury, with a fine gloss. Nearly all the fruit sprayed with bordeaux

showed spray injury to varying degrees. The seasonal conditions at spraying time are to be held responsible for the greater part of the damage. The results on the lime-sulphur plots were so markedly superior, that it was substituted for bordeaux in the general spraying of this past season. In order that I may not encroach upon your time, let me say that the results of last year's and this season's spraying experiment will be available to you before long as a bulletin of the Experiment Station.

The work of the season just passed has been a repetition of the preceding one in point of general orchard management—early and repeated cultivation, spraying, borer hunting, pruning, fertilizing. This year but 1000 pounds of a high grade, chemical fertilizer were applied per acre, and this season such application was made on the plots pastured to animals as well as on the sod plot.

In addition to the continuation of the experiments of the preceding season and a spraying experiment revised on the basis of the first year's results, including co-operative work at Greene, the new work along horticultural lines has been the inauguration in collaboration with the department of Biology, of an experiment in the breeding of apples. This has for its object the accumulation of scientific data bearing on the problems of heredity in general and their application to apple production in particular, with special reference to the production of an apple more particularly suited for commercial purposes under Maine conditions than any of the standard varieties now grown. Time alone can tell what the results may be. At present the work is in its inception. Crosses have been made, and fruits obtained. Seedlings are also being studied in connection with this problem.

The beginning of another study bearing definitely upon Maine conditions may be seen in a nursery of 3000 trees set out the past spring. These are to be the basis of a fundamental experiment dealing with the moot question of the relation of stock and scion.

Two separate divisions of the orchard have this season been devoted to an experiment with a fertilizer excessively high in nitrogen, similar to the well known Fisher formula, comparing the former with one more evenly balanced in its constituents. This being its first year, no definite results have appeared.

So much for the work of the past and the plans for the future. What are the results already obtained?

For the actual figures expressing the results of the experimental plots, I must ask your indulgence until their publication in the near future in bulletin form, as there has not been sufficient time since the harvesting of our large crops to arrange and condense them for presentation at this meeting. Suffice it for the present to say that the spraying experiments conducted not only at Highmoor, but also the co-operative work at Greene in the orchards of Messrs. Keyser, Coburn and Philbrook, indicate that lime-sulphur as a fungicide has come to stay, unless something still better takes its place; that its use can be recommended with lead arsenate, and that it is greatly to be preferred to bordeaux, especially on varieties susceptible to spray injury, even when weather conditions are most favorable. The season just closed has been inimical to the development of fungi and hence favorable to the production of clean fruit. In view of this, striking results in the way of comparative data could not be expected.

The question of animal pasturage for orchards has been quite definitely settled, so far as conditions at Highmoor are concerned. Remembering that these plots received identical treatment with that of the rest of the orchards, except in point of cultivation, be it noted that the sheep orchard pastured with five animals yielded this year at the rate of 6 1-2 barrels per acre, the hog plot 16 barrels per acre, and the cultivated plot adjacent at the rate of 127 barrels per acre.

The trees in the sheep plot were moreover in markedly less thrifty condition, judging by the color of the foliage and the amount of wood growth; and this was also true, although to a lesser degree, in the hog pasture. The hogs, also 5 in number, did not root evenly, nor were grass and weeds kept down except in small scattered patches. In general the results confirmed the experience of years of practice by the best orchardists throughout the country irrespective of region; it pays to use the plow wherever and whenever possible.

Still greater is the folly of maintaining the orchard year after year in sod. Bearing in mind that in the sod plot in our experiments the trees received the same amount of fertilizer and

identical treatment as regards spraying, pruning, etc., note the results at the close of the second season.

In sod are fifty trees nearly all of the same size as the neighboring ones under cultivation. These fifty trees produced this year 11 barrells 1 1-2 bushels of apples, of which 7 barrels 1 1-2 bushels were on the boundary line of the plot, and hence were cultivated on one side. Strictly speaking, these may be considered out of the experiment. We then have 38 trees in sod yielding 4 barrels, compared with 137 trees in cultivation yielding 254 barrels; and these 137 trees produced fully 70 per cent of the crop of the preceding year.

The foliage of this year, with the exception of the trees in sod, left nothing to be desired. It was dark green, dense and comprised of very large, vigorous leaves. The wood growth also was excellent, ranging from 8 inches to as much as 3 1-2 feet in the case of the smaller trees. The only exceptions were the occasional trees that had suffered severe winter injury. On these the leaves turned color early in September and were not as dark in color during the summer. The foliage is still adhering to the branches while the uncared for trees in the vicinity have been bare for weeks.

What of the orchards as a whole as regards the general proposition of renovation?

The crop of 1909, following the summer when the farm came into the possession of the Station was 90 barrels of marketable apples.

The crop of 1910, after one year of attention, was 275 barrels.

The crop of 1911 consisted of 2450 barrels, of which 2006 barrels contained no fruit smaller than 2 1-4 inches, of magnificent color and free from worm holes or fungous spots of any kind. As for codling moth, we would venture as a conservative estimate that not 2 barrels of apples infested with this insect were picked on the farm.

This crop was almost wholly comprised of Ben Davis fruit. The Baldwin orchard, which was in the worst plight, has begun noticeably to revive, but we may say as yet that it has only begun. Another year or two will see it bearing its quota of the crop. Even still greater crops may be expected when we remember that the largest Ben Davis block, comprising about 1000

small trees, has not reached more than one-third of its possible bearing ability.

Quite remarkable was the contrast in size of fruit on the sod and cultivated plots. Apples of high color from the latter averaged for many trees 370 to 400 fruits per barrel, and many times was a half bushel basket filled by the pickers with 65 to 75 fruits. On the other hand, there was scarcely a bushel of all the fruit from the sod plot, excepting here the outside row before mentioned, that was large enough to pass for No. 1 grade; and many of them could have successfully passed for a new variety of Crab. The trees in sod, moreover, were strikingly unthrifty; the bark had an unhealthy reddish color; the leaves were small, scant and of a very pale yellow-green.

No one factor can be rightfully regarded as of greatest importance in orchard renovation. We must spray annually and thoroughly to control the parasites of the apple. We must practice orchard sanitation in all its forms. We must fertilize in some form or other, although this is an individual problem for every orchardist, depending upon his local soil types and conditions: but the soil must not be robbed of plant food without a return. We must prune judiciously, keeping our trees within bounds and in convenient and economical shape, giving them sanitary conditions of light and aeration, opening the tops that the fruit may have all the advantage of the sun's rays.

And, finally, we must cultivate. We must plow and harrow, and having plowed and harrowed, we must keep on harrowing. If I were asked to name one factor that I regard as contributing more than any other to the renewal of vigor in our orchards at Highmoor I would name cultivation.

I realize that in this uncompromising advocacy of cultivation I shall meet the opposition of some of you men whose trees, receiving good treatment in every other way, stand in grass from year to year. They are thrifty, they bear good crops of well-colored, fair-sized fruit. Owners of such trees see no force in the argument for cultivation.

We would admit as much. When a man can say "I do thus and so and the results have always been good," there is no argument to the contrary,—in his particular case. But the fact still remains, based on decades of experience in all regions, that an apple tree when grown for profit must in 99 cases out of 100

be subject to cultivation. It is the vast aggregation of experiences and the recognized causes behind them that establish the principle.

Why do we cultivate, you may ask. Some one may urge that trees under wild or natural conditions sprout, develop and mature in uncultivated soil; that forest trees do so and wild apple trees as well. All of this is beside the point. It is true, but it does not meet the issue. We must bear constantly in mind that agriculture is an *art of man*—not a natural phenomenon; that man, when he sows the seed, expects to improve upon unaided nature by his own efforts. And it is these efforts that have developed the arts of agriculture and horticulture.

Corn was originally a wild plant and has attained its present high state of development through culture. Does any sane man plant his corn on a sod patch? Yet there are many men who buy good nursery stock, set it out in a pasture and expect a benign Providence to do the rest. When farmers and so-called orchardists realize fully that a fruit tree is an agricultural *plant*; that it requires warm, well-drained, aerated soil, freedom from undesirable plant competition and sufficient food and drink, they will be on the way towards a rational system of orchard treatment.

Until we study the question, the role that cultivation plays in promoting the desired conditions for plant growth is scarcely appreciated. Time will not permit a discussion of the different ways in which cultivation benefits. Let me briefly enumerate them, and consider but one.

CULTIVATION AIDS THE TREE.

First: By improving the physical condition of the soil. This it does in three ways:

1. By reducing the size of the individual soil particles and increasing the surfaces presented to the roots.
2. By increasing the depth of soil; i. e., by allowing a greater root run.
3. By warming and drying the soil in the spring.

Second: Cultivation augments the chemical activities in the soil.

1. By helping to set free plant food.
2. By hastening the decomposition of organic matter in the soil.

3. By promoting nitrification, the process by which certain bacteria in the soil convert unavailable organic material into chemical forms that can be directly used by plants.

Third: Cultivation conserves soil moisture.

1. By increasing the water-holding capacity of the soil in rendering the latter more porous.
2. By preventing evaporation of soil moisture.

The importance of moisture conservation could hardly have failed to impress itself upon Maine farmers and orchardists this past season. We have had in succession three very dry summers in the fruit region and the last one was the dryest. At Highmoor Farm the rainfall from April 1 to June 12, a period of almost eleven weeks in the most critical time of tree activity was 1 3-10 inches. To the end of the third week in July, covering practically 16 weeks, the greater part of the growing season, the total precipitation was 2 6-10 inches. Nevertheless, the orchards suffered in no way from lack of moisture, and it is doubtful, considering the crop as a whole, if the size of the fruit, already referred to, has been excelled in this State under the most favorable conditions in regard to rainfall in any season. In the weeks following the end of July abundant rain fell, which of course aided much towards increasing the size of the fruit.

The small amount of rain that fell at intervals in the long drought was conserved by the fine dust mulch produced by harrowing. This idea that frequent stirring serves to prevent rather than hasten the drying out of the soil may seem at first thought absurd. Its truth, however, is easily proved by a simple experiment, the results of which the speaker gave at the field meeting of this Society last August, and which your President has asked me to repeat at this time.

Three light wooden boxes, 8x8x10 inches, were lined with paraffin to make them water tight. Into each moist soil of uniform nature was lightly packed. The surface of the first box was left undisturbed throughout the experiment; that of the second was thoroughly scratched or raked daily to the depth of about one-half inch to imitate the work of a harrow. The third box after filling with earth was covered with a sod, which rooted in the soil.

These boxes were placed in the open, and protected from rain. They were weighed at the beginning of the experiment and at intervals for four days. The following results show the loss in ounces from the original weight:

Time.	Not Cultivated.	Cultivated.	Sod.
After 5 hours	2 oz.	4 oz.	6 oz.
After 1 day	4 "	4 "	8 "
After 3 days	7 "	5 "	18 "
After 4 days	10 "	5 "	25 "

The total losses in water from the uncultivated, cultivated and sod boxes were respectively 10, 5 and 25 ounces, or in per cent of loss in relation to weight of soil 8, 4 and 21 per cent respectively.

The cultivated plot lost 2 ounces more than the uncultivated during the first five hours. This was due to the evaporation of moisture from the top layer forming the mulch. It lost no more during the next 24 hours and only one ounce in the next 3 days, compared with 6 from the uncultivated box and 17 from the sod plot. Now, these boxes held but 37 per cent of a cubic foot of soil. On the basis of these results an acre of soil would lose from its first foot of depth the following amount of water in 4 days:

Uncultivated ..... 36 7-10 tons
Cultivated ..... 18 4-10 tons
In grass ..... 91 8-10 tons

When you remember that almost 85 per cent of each apple you see before you here consists of water you may gain a better appreciation of the extent to which sod or lack of tillage in an orchard robs the trees of the water necessary for the best development of their fruits. And no account is here taken of the immense amount of additional water that is daily needed by the trees themselves to perform their functions.

I do not wish to leave with you the impression that all orchards *must* be tilled, for there are too many in the State of

Maine where cultivation is either impossible or obviously impracticable. In my opinion such sites should not have been selected for the planting of trees. Since they are there, the next best thing is to conserve the soil moisture, preferably by mulching. Do not let grass grow. You cannot grow hay and apples on the same acre with profit to both crops.

On the other hand, be it understood that unintelligent tillage leads to harm. Excessive cultivation drys out the soil and exhausts the humus. It should not be carried on later than the end of July. Then a cover crop of some sort such as rye or vetch should be sown, to grow and remain until spring, when it is to be plowed under as soon as the ground can be worked. Thus the soil is supplied with the necessary organic matter which is transformed into humus and in time aids in the nutrition of the tree. Tillage without the regular addition of organic matter results in harm. For this reason cultivation and cover-cropping must be complementary. Aside from their value as sources of organic food supply, cover crops have many valuable physical properties, which cannot be discussed in the time allotted me.

In conclusion let me emphasize one point. It may be that there exists in the mind of some the conviction that we have heard expressed as follows: "Of course you can do those things—you have the State behind you." Now, as a matter of fact we have had not one penny of state aid since the farm was purchased. What we have done and are doing on a fairly large scale in the way of bringing a decrepit lot of trees into profitable bearing is what every owner of a neglected orchard can do for himself on his scale. What is required far more than great capital is the ability of each man to recognize his own conditions, to attack his special problem with judgment, undertaking only what he can succesfully finish each season; and above all to be open to new ideas and to the newer agricultural knowledge. There are still too many men owning fruit trees in the New England States who are more devout ancestor worshippers than the Chinese. They travel blindly in the rut of family tradition and family practices. They pride themselves on being "practical farmers;" which would incline one to believe that Lord Beaconfield had that class in mind when he defined

the practical man as one "who practices the errors of his forefathers."

The opportunities are here. They have been admirably pointed out to you by the previous speakers at these sessions. Natural and economic conditions will give us the leadership in American apple production if we renovate our orchards and the ideas of some of our orchardists, and adopt or adapt the methods that have brought such wonderful success to the apple growers of the Pacific Coast.

PRACTICAL EXPERIENCE TO DATE IN COMMERCIAL ORCHARDING.

Prof. F. C. Sears.

Two years ago, I spoke before your Association on "Personal Experiences in Starting a Commercial Orchard in Massachusetts," and I want this afternoon to review briefly what I said at that meeting and to bring the matter up to date.

Perhaps I ought to explain, as I did then, that in the spring of 1908 Professor Waugh and I decided that, having attempted for fifteen years to teach other people how to conduct the orchard business, we would venture out in that business ourselves. We therefore bought 150 acres of land near the Agricultural College, which has since then been increased to 250 acres, and began setting out fruit trees. The first year we set between five and six thousand trees, and we have added to our plantings each year until now we have about 120 acres in orchards. Our main plantings have been apples, though we have also set peaches, quinces, and plums, and we expect to set a few pears the coming spring. It is in reference to the many problems we have met and solved (either rightly or wrongly) that I wish to speak this afternoon.

May I first state briefly the considerations which led us to undertake such an enterprise, for it is, of course, a very unusual thing for college professors to venture into such a work. I presume that sentiment undoubtedly had something to do with our decision, for we had both been classed with the "theorists" so long that we wanted a chance to show that our theories would work. But in the main, it was a plain business proposition with us. We wanted some business to fall back upon when we should retire from teaching and we felt that orcharding, properly carried out, offered as certain returns as one could expect to get in any ordinary commercial venture. We believed emphatically in the quality of our New England apples, and we felt that our nearness to market, our cheap lands, and our

comparative freedom from labor troubles made a combination of advantages which other sections would have difficulty in equalling. And, lastly, we did not share (and we do not now share) the apprehension of many that we are on the verge of such an overproduction of apples as will wipe out all profit in growing them. We therefore ventured forth as commercial orchardists,—at first, it is true, with some fears and many doubts, but always with a reasonable amount of confidence in the final outcome. And I believe I can claim without any exaggeration that, on the whole, our enterprise has been entirely successful to date. Certainly it has been enough so to increase our enthusiasm with every year that has passed.

So much by way of introduction. Now, just a word on the subject under discussion.

The land which we bought was not all ideal. But it was conveniently located for us to get at, being only four miles from Amherst; we could get a good block of land in one section; and, above all, the trolley line from Amherst to Holyoke passed right through it, which we considered very important, as it enabled us to get our fertilizers, etc., in by trolley, and our crops out.

The principal criticism of the land would be that it is too light and sandy in some parts. But, in my opinion, this is a good fault if one cannot have ideal land; for light soils, while more "hungry" than heavy, are more easily worked, often enabling one to get at the spring work days in advance.

A point which has interested me greatly in connection with the behavior of our different blocks is the way in which those fields whose soil was in "good heart" have given us better growth and finer trees, with less effort, than those blocks which were plowed out of old pasture or run-down mowings. I am not quite ready to say that I would defer planting the orchard for a year in order to get the soil in proper condition, for when one has his mind made up, it is hard to wait. But I do most emphatically believe that if it is at all possible to decide one or two years in advance what blocks are to be set and then grow such crops on these blocks as will put the soil in the best possible condition for the trees, it is a great advantage. A somewhat larger per cent of the trees will live, they will make satisfactory growth with less coddling, and in particular there

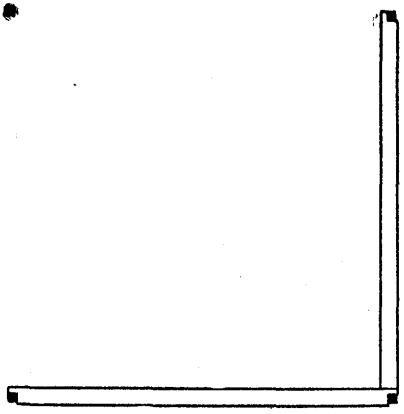
will be fewer trees where the growth is just a little too good to warrant one in pulling them out and replanting and yet not good enough to shape up into a fine tree.

The land for setting the first season was plowed as early in the spring as the soil was fit for working, and was then thoroughly fitted, by using a disc harrow, a spring-tooth and a smoothing harrow, and finishing with a planker. This left the surface smooth for laying off the orchard and setting the trees, by no means an unimportant item. After the trees were set, which I shall speak of more in detail in a moment, the land was kept thoroughly cultivated until time for sowing the cover crop, about July 10th. There was always a team at work in the orchard and sometimes two of them. And notwithstanding the fact that we had one of the driest seasons within the memory of the proverbial oldest inhabitant, and the further fact that our soil was shy of humus (an extremely important factor in holding moisture in the soil), there was never a time throughout the season when the soil was not as moist as could be wished just under the dust mulch. It was certainly a striking indication of the value of cultivation.

As soon as the trees are set, we apply an ounce or two of nitrate of soda to each tree, scattering it about the tree in a circle for a radius of perhaps two feet. And each spring this is repeated as soon as the soil is in condition to start growth. In addition to this, we go over the orchard again about July 1st and give a second dose of nitrate of soda, about equal in size, to all those trees which do not seem to be making a satisfactory growth.

Another point which we intend to insist on is giving the young trees a balanced ration of fertilizer from the start. I believe that a very common mistake is made by assuming that the young trees need only nitrogen for their growth and that not until a tree comes into bearing is there any necessity of applying either potash or phosphoric acid. So long as our young trees are as big as Smith's of the same age, we are content, mere bigness apparently being the only thing desired. Whereas, if our trees got more potash and phosphoric acid from the start, they would far sooner turn from weed growth to fruiting. This, I am obliged to admit, is largely theory, but it is a theory in which I firmly believe and on which I intend to act.

In order to carry this out, we have each year made up a mixture for our young trees of acid phosphate five parts and high grade sulphate of potash three parts, have put a pound of this around each one-year tree, and increased the application about a pound per year. On our bearing trees we have substituted basic slag for acid phosphate.



A great deal of care was exercised in laying off the orchard to have the rows straight in all directions and I should like to emphasize the desirability of this point, in my opinion. It is often, in fact usually neglected. Men will lay out a hen house, which is to stand for perhaps half a dozen years, and every corner must be perfectly square and every post perpendicular. But an orchard, which is to stand for two or three generations, is laid off with a plow, or the trees are stuck into holes dug at random! To me the satisfaction of having good straight rows

is worth ten times over the added cost of making them so, which after all is not great. We laid off our first row with a transit, because one happened to be available, but a man with a good "straight eye" could have done nearly as well. This first row was run along one side of the field to be planted and a stake was set every 16 1-2 feet, the distance apart for the trees. Then a cross row was laid off at right angles to this, near one end of the field. This was all the sighting that was done. The rest of the stakes were set with two measuring boards 16 1-2 feet long, with a small notch at each end. The accompanying diagram will serve to illustrate the method.

It was surprising to see how accurately and expeditiously the stakes were set. And it did not require high priced labor to do it either. Two Polanders, at a dollar and a half a day, one of whom could speak scarcely a word of English, did the whole thing, and we should be glad to compare results with anybody who has used a different method, for we feel decidedly proud of the way our trees "row" in all directions. For locating the trees we used a planting board, a device by no means new but which deserves a wider use than it gets. There are several types of them but the one we used was about four feet long by eight inches wide, with a notch at each end and one in the middle (see diagram).

The middle notch was placed against the stake set for the tree, a short piece of lath was then driven down in each of the end notches and the planting board was taken away and the hole dug for the tree where the center stake stood. Then when it came time to set the tree, whether it was that afternoon or the next day or the next week, the planting board was put in place on the two small stakes, the tree was slipped into the middle notch and was planted, and of course stood exactly where the original stake stood. Both of these methods, the setting of a stake for each tree, and the use of the planting board, have been objected to by those who profess to know about such things, on the ground that they take too much time, that they are slow and expensive methods. But when I say that the first year it cost us

just 6c per tree to set our standard apples, which we planted first, and 5c each for the peaches, which followed; and that we got the price down to 4c per tree on the dwarf apple trees which were the last set, I think you will agree that it was not an exorbitant price. This included plowing and fitting the land, staking it off, digging the holes, pruning the trees and setting them out, and the difference in cost was largely due to the fact that the gang of men setting the trees became more familiar, each with his particular part of the program, and consequently could do it more expeditiously.

The field operations in setting were carried on as follows: A gang of eight men and a foreman were used. The foreman and one man went to the place where the trees were heeled in, for a supply of trees, which were prepared for setting by pruning back the main roots considerably, and packed them into two oil barrels part full of water which were fastened on a stone boat drawn by one horse. While this was going on, the rest of the gang was setting stakes and digging holes. When the trees arrived on the scene, the whole gang went to setting, the foreman distributing the trees and the eight men dividing into pairs, one of whom set the tree while the other shovelled in the earth. About 150 trees were carried at a load and when these had been set out, the gang divided as before. In this way, the operations went like clockwork and the trees arrived at the holes with their roots thoroughly soaked and in the best possible condition to take hold and grow. And that the method was satisfactory from the standpoint of the trees is pretty conclusively shown from the records of the number that grew. Out of 530 dwarfs set we lost 14; of 250 Hubbardstons, 6 failed to grow; of 500 Wealthy, 3 died, and of 650 McIntosh, only 3 died. This is a remarkably good record in percentage of living trees even for a good season, but in a season like that of 1908, when crops of all kinds suffered severely, I think it demonstrates conclusively that our methods of planting were sound not only theoretically but practically.

Our method of pruning is peculiar, and in any event I do not suppose it would be applicable to your Maine conditions. Both of us are very strong advocates of low trees, believing that practically every operation except cultivating can be more economically and comfortably performed with the low headed

tree than with the high one. And even in cultivation, I believe that the difficulty of working about a low headed tree has been exaggerated and the need of getting out every weed about a tree has been over-estimated. Our plan has been to set one-year trees, getting strong, well grown stock, which means that the stock comes to us as straight whips 5 to 6 feet high. These we cut back the first year to 18 inches, and form the head at that point.

I shall say but a word on varieties, because I realize that this is a good deal of a personal matter, and because my views on the subject may be of little value to you here in Maine. But two points I do believe we ought to insist on everywhere here in New England. First, we ought to realize that as a rule we cannot grow the varieties grown on the Pacific coast. That is one of the most common mistakes of the novice in apple orcharding (and of many who would object to being classed as novices). A man sees their beautiful Jonathans, Newtowns, Arkansas Blacks, and Winesaps, and he says to himself, "That is the kind of fruit I should like to grow. Where can I get trees of those varieties?" And if he can get the trees and if he does not run across some one to dissuade him, he sets a whole orchard of this stuff when he ought to set Spies and Baldwins, McIntosh and Rhode Island Greening.

The second point I think we can safely insist on is *quality* in the varieties that we do set. I know I am on dangerous ground now. I know that your good President is all ready to cite me to dozens of men here in Maine who have a perfect gold mine in their Ben Davis orchards. And I have not a doubt there are plenty of men in this very audience who, if asked what variety to plant, what variety is giving them the most money, would say most emphatically "Ben Davis." But admitting, as we must, that it has been and is profitable, I believe that it is short-sighted policy to plant it. We are making a campaign for New England as the "Land of the *Good* Red Apple." And we are winning out on that basis. But do you suppose that a country which grew Ben Davis wholly or even largely could ever become known by any such name?

During the recent New England Fruit Show in Boston, I was asked to go out to lunch with a broker who (like so many others) thought he would like to grow apples. He took me to

his club and we had an apple for dessert (for which, by the way, he paid 10c) and what do you suppose it was? A Hood River Spitzenburg or a Wenatchee Jonathan? No sir, a New England McIntosh. And he told me that for the past two years this club has been using New England Spies and Baldwins and McIntosh, and other choice sorts. Do you suppose that this market for New England apples could ever have been recaptured by Ben Davis?

Another serious problem which we have had to solve, and which we have not as yet wholly solved, has been the cover-crop question. As I have said, our land is on the light order, which means that humus is especially important for it and also that the land washes badly. In consequence of these two facts, we have had to use large growing crops and also those which were good soil-binders. Our practice has gradually evolved to about this: We have found that soy beans, rye, buckwheat and rape are our best crops, with clover as a possibility on our best lands. We often handle a block of orchard as follows: About July 1st we will drill in soy beans, making the rows far enough apart to admit of cultivation. We then practice clean culture between the rows as late as it seems desirable for the soy beans, say till August 1st. Then we seed down between the rows with the last cultivation, using rye and clover, or rape and buckwheat, or any combination of the four crops, rye, rape, clover and buckwheat, that seems desirable, always including rye on any slope which is at all sharp. The advantage of a combination of two crops is that if one does not take the other will and where clover and rape, for example, are used, you get the benefit of a large amount of humus from the rape and the nitrogen from the clover.

Still another vexed question which we have had to decide, and which we perhaps decided differently from what many of my hearers would, was the question of the distance apart for the trees. We set them, as I suggested in speaking of our measuring boards, at 16 1-2 ft. apart each way in some cases and 20 ft. in others, depending on the soil. This is close planting, but that is what we wanted! It is not what we should advise for a great many men, perhaps the majority, because the trees will not be cut out when they begin to crowd each other, nor

will they be pruned in such a way as to prevent crowding as long as possible. Both of these points we intend to look out for. We have used what is called the "filler system." That is, our permanent trees are set about 33 or 40 ft. apart, but are interplanted both ways so as to bring the trees down to 16 1-2 or 20 ft. apart. For these fillers we are using such early bearing varieties as Wealthy, Wagener and Duchess of Oldenburg and for our permanent trees such sorts as Baldwin, Hubbardston, Greening and Gravenstein. We intend to practice repressive pruning, to head the trees in every year so that they will not begin to crowd for as long a period as possible. It ought to be possible to delay this crowding until they are fifteen years old at the very least. But when they *do* begin to crowd we are going to cut out the fillers and have the entire land for the permanent trees. And right here is where the difficulty usually comes in. Most men *will not cut out their fillers in time.* I hope and believe that we *will.* It ought not to be any more difficult than pruning. When we prune, we cut away part of the tree for the good of the rest of the tree. And when we remove fillers we cut out some of the trees entirely, for the good of those that remain. We may have to tell the foreman to cut the fillers and then go away ourselves and stay away till the job is done, but one way or another I expect to see those fillers come out before they have damaged the permanent trees.

The whole question of fillers narrows down to this: If a man can use fillers and bring them into bearing early enough so that they will be more profitable than growing an annual crop between the trees, and if he will then cut out the fillers, as suggested, it is a profitable scheme. But if he fails in either of these particulars then the plan is a failure. Some people object to the filler scheme because, they say, the tree has to be cut out just in its prime. But this has absolutely nothing to do with the question further than being responsible for most of the failures of the scheme. If the trees have been the most profitable thing you could have in the land while there, they have done their whole duty and have vindicated your judgment in setting them out. And the fact that if they were somewhere else they might continue to be profitable, while an interesting fact, has nothing more to do with the question at issue than the price of gas.

The last point which I wish to discuss, and one which is also largely a personal question, though there are some general principles involved, is the matter of what crops to grow in the orchard for the profit to be gotten out of the crop and not, as with the cover crops, solely to benefit the orchard. For while the bearing orchard of course uses all the land and pays a profit on it, or *ought* to, the young orchard is, for several years, a source of out-go and the land ought to be planted to some crop which will yield a profit and at the same time either directly benefit the orchard or at least not injure it.

A crop to be satisfactory in an orchard must first of all be a cultivated crop. I do not believe in either a hay-crop or a grain-crop for an orchard, whether young or old. And if the crop is to be cultivated, the more thorough cultivation it requires and the more nearly its season for cultivating corresponds to that of the orchard, the better. I am sure that a cultivated crop is usually far better for the orchard than if no crop is grown, for unfortunately the average man will cultivate his annual crops when he might neglect his orchard.

Secondly a crop, to be entirely satisfactory, ought not to disturb the soil late in the season, as, for example, in digging a crop of early potatoes. If the crop grows late in the season, which is in itself no objection but rather the reverse, it ought to be something like cabbage or squash which does not disturb the soil when gathered. Of course this objection can be overcome by planting the crop far enough from the trees, but this solution has its own weak points as we lose the use of a lot of land which might just as well be giving us a profit.

Furthermore, the crop must also be something which the owner of the orchard can either use on the farm (as a crop of turnips or mangels for stock feed), or else must be a profitable crop to sell.

The crops which we selected, having regard as far as possible to the above general principles, were beans, cabbage, and squash. They are all of them good crops and I think have, in general, proved satisfactory, and we shall use all of them another season.

We have found the work at all times of absorbing interest and for the most part our plantings have come along satisfactorily.

There have been failures, it is true, and problems without number, some of which have been solved and some of which still await a solution. We felt, during the early years of our work, a good deal of sympathy for the man who stays out of orcharding because it is a "long-time investment," but now that we have passed our fourth year, our oldest plantings really begin to look like orchards, and the interest, the enthusiasm and we shall hope the *returns* will increase with every year. Mind I am not urging anyone to go into orcharding. I am satisfied that hundreds have gone into it who ought not to have done so, but for one who understands the business and, above all, who likes it, I believe that success is assured. We hope to find ourselves among this class.

INDEX TO AGRICULTURAL REPORT.

INDEX TO POMOLOGICAL REPORT.