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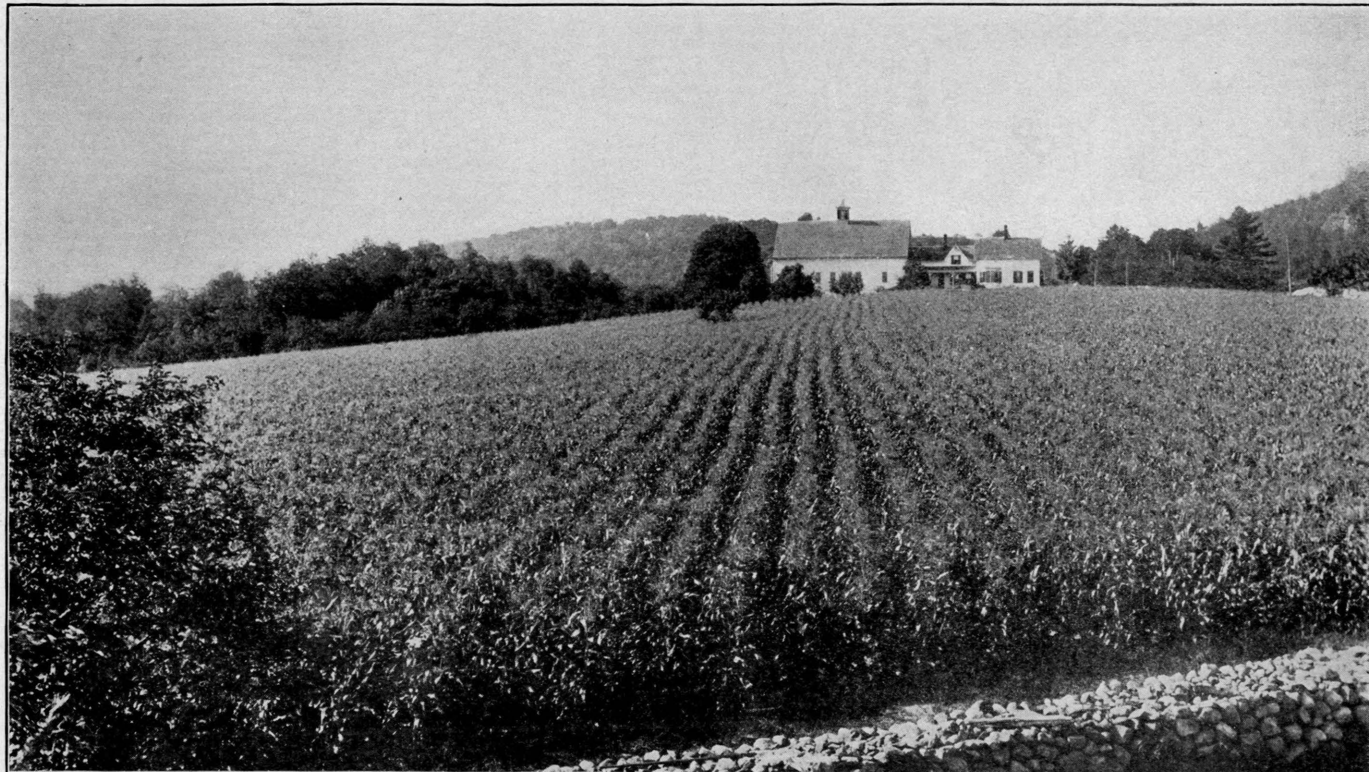

Sweet corn field, L. E. McIntire, East Waterford.

AGRICULTURE OF MAINE

FOURTEENTH ANNUAL REPORT

OF THE

COMMISSIONER OF AGRICULTURE

OF THE

STATE OF MAINE

1915

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DEPARTMENT OF AGRICULTURE.

To His Excellency, Oakley C. Curtis, Governor of Maine, and Council:

I herewith submit my first annual report as Commissioner of Agriculture of the State of Maine, for the year 1915, in compliance with chapter 204 of the Public Laws of 1901.

WILLIAM T. GUPTILL, *Commissioner.*

Augusta, December 31, 1915.

ANNUAL REPORT OF THE COMMISSIONER OF AGRICULTURE.

I regret that the year 1915 was not as propitious for the agricultural community as it might have been. The undue rains during the last of June, July and August practically destroyed the money value of the crops that were planted in the southwestern section of the state as far north as Bangor. This wet weather also made it very difficult to harvest the hay of which there was an abundance, but it was harvested under such adverse conditions that its quality was inferior. The sweet corn crop was not one-third of a normal crop and the potato yield was not more than one-fifth of a normal yield. The apple crop, also, was very short, not owing, however, to the wet weather but rather to other conditions. These conditions applied only to the southern portion of the state. Such a year as this emphasizes the importance of the live stock industry and makes especially apparent the stability of the small profit of keeping dairy herds. The crops, such as they were, sold for a high price and helped to sustain the farmers and keep going the farms that depended entirely upon agriculture for an income.

SOME UNFORTUNATE CONDITIONS TENDING TO DETRACT FROM FOOD PRODUCTION.

There has long been a promise of a seed time and harvest, annually. If, however, the seed time is not taken advantage of, the harvest must suffer in consequence. At the present time the labor conditions are such that it is well-nigh impossible to get help temporarily for either the seed time or the harvest. I might say that it is well-nigh impossible to get help for any season during the year on the farm. This condition has made it imperative that every available labor-saving machine be used and that the farmer operate only so much as he can with his own help.

There are other conditions, too, that tend to reduce food production, which can and ought to be changed. The present great boom for good roads—which is worthy in itself and which everybody approves, especially those who ride over them— is now done during the months of May, June, July and August and it takes from agricultural labor thousands and thousands of days' work direct from the farming class which ought to be producing food. The farmers work upon the highway not only for the income that it gives them, but also because they are interested in the good-roads movement.

It seems to me that the roads could be advanced even more than they are now and not interfere with the actual work of food production. The custom should be established, or the example set, of preparing the roadbed to be graveled during the autumn and leaving it until the late fall or winter before the gravel is put on. The following spring the gravel could be put in place by the road machine and the work entirely completed. This would leave the agricultural community free to work on the farms during the crop-growing months of summer and the compensation for the work on the road would come as a sort of gratuity, because many farm teams are idle, or nearly so, during the winter months.

If efficiency and economy were being consulted it seems to me that this is the way this question should be handled. At any rate, it would leave a very large population of the agricultural community at liberty, during the summer months, to engage in some kind of productive labor, and would make for the prosperity of the agricultural community in the state, not only by having the crops to dispose of but would, also, accomplish the desired end of having acceptable roads.

This same tendency at the present time prevails throughout the entire length and breadth of the nation and is one of the principal causes for the reduction of the crop output that has been so noticeable of late years. The United States as a whole has ceased to be a meat exporting country and is now a meat importing country. The shipments in corn and wheat have dropped materially in the last few years and it seems as though there was a mania for everyone to engage in non-producing pursuits, all of which tend to increase the cost of living.

FOOD SUBSTITUTES.

As a compensation for the falling off in actual food production, wastes have been transformed into food products, showing how highly organized is the efficiency of our manufacturing industries, even if the producing population is continually tending away to the non-producing labor. I am referring now particularly to the dairy industry.

In the last ten years the number of cows in the State of Massachusetts has decreased fifty-four thousand; in New Hampshire, twenty-seven thousand; in Maine, thirty-three thousand; in Vermont, the percentage of decrease has been as large, although the exact figures are not available. This would naturally mean that the price of milk and butter would advance; or, comparing this industry with a manufacturing industry, if the output decreased by one-fifth, the increase of price would be very noticeable Yet, at the present time, the price of milk and butter throughout New England is not more than it was during the war, fifty years ago.

The difficulty is that the tendency is entirely toward milk production in the New England states and the shipment of milk and cream, rather than the making of butter. The making of butter at the present time is but an incident, and, if the price of butter goes above a certain figure, people are urged by the manufacturers (and their agents who are distributed everywhere) to use oleomargarine in its place. The argument is continually put up that this grease is made under the most sanitary conditions and is very nearly the equal of butter.

Now, if there is anyone who, from choice, prefers oleomargarine to butter, I am perfectly willing that they should use it, but I wish to assure the public as a whole that oleomargarine, in its best condition, is very much inferior in cleanliness and healthfulness to the poorest butter. This stuff is shipped into the State of Maine, not only in carloads but in trainloads and the people in Maine are gradually becoming grease eaters instead of butter eaters, and, as it is entirely involuntary on their part, that is the reason I call attention to it.

I have attempted to follow shipments of tallow from this state to its final destination, the oleomargarine factory, but it passes through too many hands to make the shipment absolutely certain. It is pretended that this is done under government inspection, yet nobody ever hears of a government inspector who is looking after the shipment of tallow from this state to the oleomargarine manufacturers. Even if there were inspectors, or if all of the tallow from which oleomargarine is made was from inspected meat, it proves nothing. It only tends to allay the prejudice that the public minds entertain regarding the general product, for the United States inspectors throughout the entire length of the land, in every state, pass, for food and for food products, nearly three-fourths of those animals that are condemned for tuberculosis by tuberculin test. This makes an unpleasant condition of affairs, because I do not believe that any person, whoever he be, cares to eat meat either from a diseased carcass, or tallow in oleomargarine from a tuberculin animal.

The only way, however, that it is possible for the people of Maine to enjoy the certainty of eating meat that is not diseased, even if it has been inspected by the United States inspectors, is to pass laws that such meat shall not be used for food in the State of Maine and that no meat killed outside of our borders shall be used for food within the state unless we are positively assured that it is from creatures free from disease. It will be necessary to establish a standard independent from that of the Federal Government, or our people will still be consuming diseased meat.

If nothing but butter was allowed to be used on the tables of restaurants and boarding houses the price of butter would advance to a figure that would make it profitable to keep cows and thereby increase the number of live stock. This would ultimately tend to lower the price of meat.

It is impossible to encourage farmers to engage in any line of agriculture that is unprofitable; and it is impossible, except by law, to restrain them from engaging in any particular occupation that appears to be especially remunerative. It, therefore, follows that some steps must be taken, or the dairy industry will surely follow in the steps of the sheep industry and dwindle until it ceases to be one of our leading industries. This does not mean that there are not men in the State of Maine who are making good profits out of herds, but in that case they are special examples rather than general examples and sell their surplus stock for breeding stock, to which is added the natural product that the herd produces.

CONFLICTING OPINIONS ABOUT FARMING.

The man who lives in the city and works for day pay in an established industry and lives in a rented home, moving spring and fall from one location to another, loses the instinct of attachment to locality. He does not attempt with his own hand, or by his own effort, to fix up or beautify any residence that he may occupy. He demands this to be done for him by the landlord, if it is done at all. His instincts change from home to community instincts which demand schools, highways, streets and public service and that these be made for him. His impression of the farm is, that it is simply a place to produce food, and an abundance of it, so that it shall be cheap. He believes the farmer, inasmuch as he has a property investment in the land and house that he owns, to be under a moral obligation to produce food. This has become a settled conviction with the people who work for a living.

There is another class living in the cities who increase their earnings from investments in industrial stocks, or railroad stocks, or steamship stocks, or loaning money in this direction, that direction, or the other direction, or who are allied with banks and banking interests, that have been taught by their associations to look upon the farm as an industrial unit and they continually ask, "Why doesn't this farmer use business methods? Why doesn't he produce sufficient produce so that its transportation over our railroad and steamship lines would enable these companies to pay big dividends on their stocks? Why doesn't the farmer become simply a freight producer?"

Opposed to these conditions are the inborn and ingrained traditions of the farmer, himself. He owns his farm and operates it as a home—not for the purpose of producing freight that railroads may declare big dividends by hauling it to market, or that food shall be cheap in the cities. These two things concern him little. This piece of land with the house and barn, comprises his home and to this home instinct everything on that farm is subordinate. Business principles have not—and it is safe to say never will—supersede the idea, "this is my home." If he makes money, well and good. It he does not, it is still his home and he cuts his expenses to the size of his income. The State of Maine is to be congratulated that, up to the present, the agricultural community is a stable community with the home instinct.

Thousands of farms in the State of Maine are today in the hands of the descendants of those who received their grant to this piece of land when it was a wilderness, and they are attached to it as they are to nothing else in the world. The reason that so little headway is made in dealing with the agricultral community by business interests is, that they cannot conceive this particular phase of the question. The agricultural community is not, and does not intend to be, lured into any scheme by which it may, by accident, or otherwise, lose the title to its land.

The tendency of agitation from men who consider themselves public benefactors has been to treat the farm from one of the two city standpoints—either as a food-producer, in order that food may be cheap, or as a freight-producer, that transportation companies may declare big dividends. Both these conditions are resented by the agricultural community and very justly, too.

Recently there has come a third element into the conflict in the nature of inspection. This was first brought to public attention by the Boston Board of Health. The Portland Board of Health immediately began to feel as though the Boston Board of Health was doing something that made it very popular and at once began a series of agitations for inspections, following in the footsteps of the Boston Board of Health.

BOARDS OF HEALTH AND WHERE THEIR RIGHT OF INSPECTION BEGINS AND ENDS.

The Boston Board of Health, within the past few years, has assumed the right to send a stripling to the State of Maine to inspect the farm homes where milk was produced, if the producer was unfortunate enough to be obliged to sell milk that ultimately went to Boston. This young gentleman seems to act without any special method or system of action. Two places side by side—one equally as good as the other—one is rejected and the other accepted. In the case of the one that is rejected, the product is excluded for a few days or a week, by the creamery to which he has been selling and then, with the slightest apology of fixing up or cleaning up, the milk is again accepted. This inspection is without law and without authority.

The creameries in Maine that ship milk to Massachusetts points came to the 1915 Legislature, asking for a law permitting the Department of Agriculture to inspect the places from which they bought milk. The Legislature refused to grant this right, even to a creature of its own making. It is, therefore, improbable that they intend to grant it to a creature appointed by the Boston Board of Health. This inspection causes continual concern among the milk and cream producers of the state, because it is absolutely autocratic in its make-up and may deprive them, for one week or one month, of the income of their herd, upon the say-so of an irresponsible person who is not even a citizen of the state.

Steps ought to be taken to stop this annoyance of the farmers of Maine by authorities outside of Maine. If Boston does not want Maine milk, and cannot determine what Maine milk is good and what is not when it gets to Boston, and what they can accept and what reject at that point, it would be well for them to get their milk from some other source.

The Portland Board of Health, emulating the example set by the Board of Health of the larger City of Boston, and very ambitious to show how up-to-date and advanced in sanitary science it is, has, in the past few years, cut many spectacular figures in the attempted inspection of farm homes. It first, a few years ago, passed an order that the milk of no cow that was not first tuberculin tested should be sent to Portland. This had the appearance of a collusion between the veterinarians of Portland, who wanted the dollar they got for testing the cow, and the Portland Board of Health. The milk producers who supplied Portland at once organized and employed veterinarians from Lewiston. The wonderful stir that they had created collapsed and today no one hears anything from the Portland Board of Health about milk from tuberculin tested cows.

Today its great fad is that an inspector must be put out to inspect barns. If this august body had taken pains to listen to Dr. North, the eminent authority who looks after the sanitary milk in New York City, deliver his address at the State Dairy Conference, in December, at Lewiston, they would have learned that the surroundings of the barn have little to do with sanitary or insanitary milk. They did not hear Dr. North's lecture. Evidently they preferred to remain in the limelight of forever talking about sanitary milk and never obtaining it.

Unquestionably they can sample every can of milk that comes across the city line of Portland, or sample every can of milk that is offered for sale in Portland and, if it is not wholesome, can condemn it, and at this particular place their authority ceases. If the time has come when the Portland Board of Health can send inspectors into a home to inspect its condition, except for disease, the farmers of Maine want to know it. The old English Law was, that a man's home was his fortress. If that law has been repealed or modified, the farmers of the State of Maine want to know when it was done; or, if it has not been done and is about to be done now, they would like to know the definite time when that change is likely to occur.

After any product leaves the farm it can be inspected and, if not fit for food, can be condemned. The conditions under which that food is produced is of no concern whatever to a board of health, or to anyone else, unless it becomes a menace to the public health. If milk is inspected and sampled when it arrives in the city it cannot become a menace to public health, under any condition. So far as milk being a menace to public health, we have more light on that subject than we formerly had. Mr. Williams, the Sanitary Engineer for the Massachusetts Board of Health, testified before the Interstate Commerce Commission in Boston, during the month of March, in the rate case hearing, that not one per cent of the literature written on disease transmission by milk was worth the paper it was written on. Mr. Williams is an eminent authority and this was his voluntary assertion under oath.

The old idea of a board of health's duties and the reason it was given the autocratic powers which it possesses was that, in case of public epidemics or of contagious diseases, some source of authority should exist, entirely above and beyond the ordinary authority given to municipal officers, to protect communities from these diseases. It was hardly expected that these boards of health would arrogate to themselves the responsibility of pure food inspection, which is entirely an administrative function of the government. It seems, however, that the pure food inspection appeals to their taste and fancy more than location of disease.

It has been a source of wonderment not only to myself but to many others that employees around the eating places in our cities, suffering with syphilis, have gotten by these argus-eyed protectors of public health. Yet the pure food inspectors from the Department of Agriculture have several times located and had removed such afflicted persons, while the board of health has paid not one particle of attention to what is presumably their duty; and it is left for men not medically trained to call the attention of proprietors to these conditions, rather than for a board of health which is trained, and whose duty it would seem to be. So far as I, myself, am concerned, I would prefer to eat a slice of rotten watermelon or a piece of bad meat, or drink a glass of the dirtiest milk, rather than to be served once by a waiter, or to have the dishes from which I eat washed by a person suffering from this loathsome disease.

The activities of the Department have been going at full swing. The agricultural societies and the Department have worked very harmoniously together, there not having been a ripple of ill will or of friction, to my knowledge.

GYPSY MOTHS.

The field agent for the gypsy moth work has been Ed. J. Cadey of Portland. Mr. Cadey has demonstrated his capabilities again and again and, as a final proof, the United States authorities did not find a single new town infested with the gypsy moth during this year. The Federal authorities have assisted us materially in the fighting of this pest, and especially in the breeding of parasites. John Summers, from the United States laboratory at Melrose Highlands, had charge of the Department laboratories at Deering during the season; 20,535 of the different parasites were located in different parts of the state.

The pest is worst in York county. The other counties—those in the southern part of the state, especially—are infested only in localities. They include Cumberland, Sagadahoc and Lincoln. The infestations in the other parts of the state are small and of not much consequence at the present time. It is the hope of this Department that the parasites will equal or exceed the expectations we entertain of them; and that they will establish themselves where there are large colonies and, in time, will follow and hold in subjection this terrible pest. This, however, is only a matter of theory and it will take years yet to determine whether this will be true or not.

BROWN-TAIL MOTHS.

The state has been remarkably free from brown-tails during 1915. This is owing less to the parasite than to local conditions. There were only two areas, and those not of any great size, that were badly infested, that were discovered during the spring of 1915. One was in a section near Sebago Lake and the other in the southern portion of Sagadahoc and Lincoln Counties.

WEIGHTS AND MEASURES.

The work of the Bureau of Weights and Measures has been carried on by Edgar A. Russ of Dexter. Mr. Russ has made a most efficient and very acceptable deputy sealer, capable, fearless and just. Mr. Russ has succeeded in seeing the law enforced in practically every town in the State of Maine.

HORTICULTURE.

The Bureau of Horticulture has had for its head, A. K. Gardner, who, for a number of years, has been State Horticulturist and has been very successful in advancing orchard interests, not only in a horticultural way, but has interested himself in the market side of the question.

BUREAU OF INSPECTION.

The Bureau of Inspection, under the management of A. M. G. Soule, has taken several important steps that need to be mentioned. One was the digging out of the fertilizer situation which, heretofore, had been very much obscured and which had caused farmers all over the State of Maine much uneasiness. The situation has very much improved during the year and it is a perfectly safe guess that the fertilizer manufacturers in the future will take pains to see that their goods comply with the law in every detail. We judge that it was not so much a matter of dishonesty as a matter of carelessness on their part, but there is no doubt but that they know now that the importance of the fertilizer trade to the people of the State of Maine is recognized.

It has been my good fortune to obtain the record of several transactions, made outside of New England, in which the sale of fertilizer, brand for brand with the sale in Maine, showed a decidedly less price for the territory outside of New England. This should not be allowed and the next Legislature should make it a part of the registration that people in Maine shall be able to purchase their goods as cheaply as any state in the Union, taking into consideration the freight differential.

Active work in inspecting sardine factories along the coast has been done by Mr. Soule, through his pure food man, Louis Garcelon, in connection with the Federal inspector. These two activities deserve special mention, besides the other numerous inspections, including the inspection of drug stores, grass seed, insecticides, fungicides, commercial feeding stuffs and the pure food work, the inspection of which was conducted with its usual vigor.

SEED IMPROVEMENT WORK.

The seed improvement work this year has been conducted by the Assistant Dairy Inspector, E. A. Rogers of Brunswick. Mr. Rogers has had lots of experience along this line and has proved himself to be a very efficient man for this class of work. There were between sixteen and seventeen hundred acres that were inspected by Mr. Rogers and his assistants, and between twelve and thirteen hundred that passed inspection.

The corn, beans and oats were not entered in increased acreage, as in the case of the potatoes. There were, however, fields entered of corn, beans and oats. The work should be conducted along lines that will make it possible to keep this work going, inasmuch as the quality of the seed is one of the determining factors whether the quantity planted yields a profit or loss.

DAIRY INSTRUCTOR.

The dairy interests of the state have been under the direct charge of J. H. Blanchard of Auburn, the Dairy Instructor. Mr. Blanchard has taken a very lively interest in this subject which, added to his consummate ability as an organizer and his untiring work, has created a new interest in the keeping of live stock, increasing the number of cow test associations by more than one hundred per cent. The unfortunate thing is that, after a cow test association is formed, the work is too exacting for the price that is usually paid and the tester unwillingly leaves his job for more profitable work.

BUREAU OF MARKETING AND SUPPLIES.

The Bureau of Marketing and Supplies has been in rather a disorganized condition. Mr. Embree, who was at the head of this department at the time I became commissioner, seemed to feel as though his work in organizing these unions placed him in the position so that he was privileged to do as he chose and that it was not necessary for him to account to anyone for any of his acts. I allowed this thing to proceed until the first of July, when the shipping season for 1914 crops closed, and then asked him to explain to the public, at least, what he was doing and how he was doing it. Mr. Embree was either unable or unwilling to make any explanations.

As a result, F. L. Hutchinson of Dexter was appointed in his place. Mr. Hutchinson is a man of thorough business training, very far sighted and understands the conditions under which the unions should work perfectly. He has been, ever since the unions were instituted, closely connected with the unions. He has been of immense value, not only to the Farmers' Union, but also to the Apple Growers' associations. The different exchanges around the state have called upon Mr. Hutchinson continually for information relative to their business, which he has freely given. At the present time a very large part of them work in perfect harmony with this representative of the Department.

INSTITUTES.

The regular institutes were conducted during the months of October, November and December. We were very fortunate in obtaining two interesting and able speakers—R. G. Hynicka of Lebanon, Pennsylvania, who discussed the care and breeding of horses, and George V. Smith of West Willington, Connecticut, who spoke upon the raising of poultry. These out-of-the-state speakers were ably supplemented by men from the

State of Maine, among whom were J. F. Buker of Bowdoinham, E. E. Additon of Leeds and O. B. Griffin of Caribou. Miss Alida A. Barrows of Augusta was also employed to speak upon the domestic science side of farming problems, inasmuch as the home is one-half of the farm.

There have been, besides, very many calls for speakers from different sections of the state. These have come largely from the grange. We have sent speakers in every instance and have felt that it was a very desirable arrangement. The grange is an organization complete and perfect in itself, with halls and audiences, and the Department is able to reach a much larger portion of the people in this, than in any other way.

DAIRY CONFERENCE.

During December a very successful combined meeting of the Dairymen's Association, The Seed Improvement Association and the Breeders' Association was held at Lewiston. It would be a hard matter to find a lot of higher authorities than those who presented the different phases of the dairy questions at this meeting, and it was really a very pronounced success.

DEPARTMENT OF AGRICULTURE.

A few years ago—within the memory of many young men—the Department of Agriculture of the State of Maine consisted of one desk and one man and was stowed away in the attic of the old State House. As time progressed, one bureau after another has been added to it until now its duties embrace the supervision of every agricultural activity and to this, also, has been added the inspection and supervision of every kind of food consumed.

Among the laws in this Department that interest the consumer may be mentioned the Bureau of Weights and Measures; also the Inspection Bureau. This latter, as I have previously said, applies to the inspection of fertilizers, commercial feeds, fungicides and insecticides, and drug and food inspection. The Net Weight Law—that little inoffensive law which means so much—which says that all packages of food that sell for more than five cents shall have plainly stated upon its wrapper the net weight or quantity, is a consumers' law, and applies to butter, candy, bread—if wrapped; oysters, canned goods and all articles of food in a package. The milk inspection, also, is a consumers' law. This Department, therefore, works not only through its dairy instructor to produce milk, but through the dairy inspector who sees that the milk is such as the cows give and not manufactured or adulterated. The Apple Packing Law is also a consumers' law.

It, therefore, becomes evident that every man in the State of Maine, whether in city or country, is interested in the Department of Agriculture and the one who administers it. It is at the present time the largest department and has the largest number of employees of any department around the State House and the activities are the widest. It seems reasonable, therefore, that this office should be an elective office, the same as the governor and the state auditor, and should be elected for the same term as the governor and the auditor.

So far as the duties of the office are concerned, there is nothing but that any man of intelligence and decision, with a sense of justice, can administer, even from the start. In the last eight years we have seen four men, successively, commissioners, and while there has been more or less cry at different times against each one, it has been rather of a political nature than otherwise. It is my belief, therefore, that the office should be made elective and of the same term of office as the governor and its operations should be rigidly scrutinized.

I was very much surprised to learn, when I attended the meeting at Washington, where the commissioners of agriculture formed themselves into a national association, that practically every large agricultural state in the United States elects its commissioner of agriculture by ballot. In fact, the ratio of the states that elect their commissioners by direct vote and those that have them chosen in some other way are in the ratio of about three to one.

ACKNOWLEDGMENTS.

I wish to extend my sincere acknowledgments to Governor Oakley C. Curtis and his Council, who, upon every occasion, have shown every courtesy and favor possible. I also want to extend my acknowledgments to the grange authorities, both

Pomona and subordinate, throughout the state; to the agricultural societies, which have assisted us very materially; to all of my staff for their loyal and efficient support in helping to maintain the high standards which the people we serve expect of this Department; and to the stenographers through whose hands the public is reached. Also to the host of country people whom I meet that have, upon every occasion, made manifest their kindly feelings and belief in my integrity.

REPORT OF STATE DAIRY INSTRUCTOR.

To Hon. W. T. Guptill, Commissioner of Agriculture:

I hereby submit my report as Dairy Instructor for the year 1915. I was appointed to this office on May 24, 1915, and at once endeavored to familiarize myself with the conditions under which the dairymen are laboring, and the manner in which their products are handled by the different companies engaged in selling dairy products. Dairymen in different sections of the state have been visited, as time would permit, and a careful study of some of our creamery plants has been made. I desire to express my appreciation for the desire on the part of the dairymen to talk over with me their trials, and also the uniform courtesy extended to me by those in charge of the different creameries of the state, and the valuable information which they have so willingly given. I have endeavored to strengthen the bond of confidence between the producer and dealer in dairy products, and I believe there never was a more harmonious feeling than at the present time.

I have not been able to respond to all the requests for my time, but have attended two Farmers' Institutes, six Breeders' Association meetings, 12 cow test association meetings, eight Pomona and 12 subordinate grange meetings, and two farm demonstration meetings. At these meetings, with the exception of the Farmers' Institutes, addresses were made along dairy and cow test association work, also upon the value of skim milk as a food for farm animals. The number attending the meetings addressed was practically 2,560, or an average of 64 for each of the 40 meetings.

At these meetings there was a commendable degree of interest shown, especially by those whose chief source of income is their dairy. I believe the greater part of our dairymen read dairy literature and, as shown by their excellent exhibit at the Dairymen's Conference, are improving the quality of their product.

At your request, I officially attended the fairs at Belfast, Cornish, Houlton, Presque Isle, South Paris, Canton, Farmington, Woolwich, New Gloucester and Topsham. Poultry was the only stock that I saw shown for premiums at Belfast. At the other fairs a creditable showing in beef and dairy stock, also in farm products, was made. No report of the above named fairs would be complete that failed to commend the excellent work of our Girls' Canning Clubs. The ladies' fancy work was the best ever seen, and no one could stand by the show ring and see the splendid type of horses of Aroostook county, without increasing his pride in the Pine Tree State.

Notwithstanding the fact that grain is high, competent labor almost prohibitive, and everything that enters into the cost of production of dairy products appears relatively higher than the price received for their products, we have many practical dairymen in Maine, with a large amount of capital invested in their business, that are demonstrating the fact that, when the same business methods are employed in dairying, as are employed by the successful merchant, banker, or manufacturer, dairying is sure to return a reasonable compensation for honest, intelligent toil. By having a certain income each month, a more economic purchase of farm supplies can be made.

The dairymen of Maine are paying too much of their hard earned money for what can be profitably produced in Maine—I refer to grain and horses. Excellent yields of corn, and as high as 91 bushels of oats from one acre, are reported. Considering the large acreage of land in Maine suitable for the growing of grain, and the increasing freight rates upon the western product, it would seem that more attention should be given to the growing of grain. The Live Stock Sanitary Commissioner granted certificates for 8,376 horses to be shipped into Maine during 1915. These represent a value of at least $1,500,000. Many farmers are now raising some of their farm teams and I believe the industry should be encouraged.

After a careful study of the problems before the dairymen of Maine, I believe they can increase the net income of their herds by: Increasing the production, decreasing the cost of feed, receiving more for their product.

The production of a herd of a given number of cows may be increased by: Better cows, better feed and care, selling low producers and putting higher producers in their places.

The cost of feed may be decreased by: Raising more of our feed, raising more of our farm teams, by a more economic combination of dairy rations.

More can be received for the products of the dairy by: A more careful study of the market end of the industry, a more judicious use of the bi-products, as skim milk, calves, carefully husbanding all the fertilizing material, a more systematic organization for mutual protection.

Nothing in my opinion so cripples the dairy industry in Maine as the pernicious custom of killing the bulls before the capacity of their daughters has been ascertained. At least 75 per cent of our cows are sired by bulls that were killed before any of their daughters were tested at the pail.

Prince Ybma Spofferd 6th was the sire of eleven daughters. Before his value was known, he and three of his daughters were killed. Of the eight living daughters, four, or fifty per cent, have records of over 30 pounds in seven days. According to the Blue Book, this bull stands far ahead of all others as the sire of thirty-pound daughters. This young sire, valuable because prepotent, should have been kept to improve our herds.

The efficient work of the cow test associations has demonstrated their value. The plan of these associations is to join the influence of twenty-six owners of cows, and to employ an advisor whose duty it is to co-operate with the owners of these cows in determining the production, cost of feed and the most economical way to manage their herds. The records of a herd serve as a guide in breeding, selling and feeding.

There are now twelve cow test associations doing active work, seven having been formed during the year. In some instances the members of the associations are so far separated that a meeting of all the members is impossible. This greatly retards the work, as great benefit can be derived from all meetings of the association, which are held regularly. I believe these associations are of great value to the dairymen, and shall endeavor not only to form new associations, but to strengthen those already formed. Properly organized, a cow test association should save in the purchase of grain, fertilizer, farm machinery and farm supplies, more than what it has cost.

The county demonstrators, from the nature of their work, are in a position to render great assistance in strengthening these organizations, and I desire to express to them, the State College and the Maine Experiment Station, my appreciation of their valuable services rendered in forming new associations and otherwise assisting in the work of this office. I sincerely hope the benefits derived will be mutual.

The prospect for a successful future seems bright. Dairy barns that are an honor to the state have been recently built and others in process of erection. The dairy exhibit at the last dairy conference was favorably commented upon by those in a position to judge, and clearly shows that the dairy conditions in Maine are improving.

I desire to express to you, my deep appreciation of your many valuable suggestions; to the members of your department, my thanks, for the uniform courtesy extended; to the press of the state, my obligation, for the many notices and kind reports of meetings; to the grange, my kind remembrance, for the many hospitalities I have so much enjoyed; and to the dairymen of Maine, my best wishes, as a slight token of my esteem of their hearty co-operation in trying to make the duties of this office pleasant.

Respectfully submitted,

J. H. BLANCHARD,

State Dairy Instructor.

REPORT OF ASSISTANT DAIRY INSTRUCTOR.

To the Hon. W. T. Guptill, Commissioner of Agriculture:

I herewith submit my first annual report as Assistant Dairy Instructor in charge of the Seed Improvement Work of the State.

On May 4, the executive committee of the Maine Seed Improvement Association met and elected your Assistant Dairy Instructor as secretary of their association. In taking up this work the secretary found that while it was very important that crops like beans, corn, oats and many others should have the interest of the association and the Department of Agriculture extended to aid their betterment, the potato interest was by far greater than all others combined. The amount of money taken in by the potato growers for seed potatoes sent out of the state is many times greater than that taken for all other crops sent out for seed purposes.

The seed potato trade of Maine is, at the present time, large, but is capable of being greatly increased, provided the potato growers in our state take pains to keep their product above that of other states.

Wisconsin, Minnesota and Michigan are making a determined effort to get and keep much of the seed potato trade which now comes to our Maine growers. This should not be allowed and, whether it is or not, depends largely on the interest which our growers take in the matter. The southern seed trade is demanding more and more each year seed true to name and free from disease. It has not gotten seed of this class from Maine in far too many cases in the past.

It is just as easy for our Maine growers to produce seed of the highest class as mongrel stock, and at a much greater profit to all concerned. It seems to be a matter of education among our growers. For this reason I have at all times tried to make this work as instructive as possible to every farmer who entered any crop for certification.

There have been many growers who have quite a seed trade who have never made any systematic effort to improve their own seed stock. Had the same care been taken by the potato growers to grow thoroughbred potatoes, as has been taken by our dairy interests, horse and swine breeders, the seed trade of the state would have been worth many hundreds of thousands of dollars more than is the case at present.

I recall one case in which one man who had quite a seed trade south, who last spring bought, at ten cents per barrel, several scores of barrels of potatoes for his own planting, from his neighbors who were hauling them past his place to a starch factory. He could have no surety that these were not mixed and, indeed, such was the case. Many acres planted from this seed were entered for inspection and certification, but were disqualified for varietal mixture and disease. It is my firm belief that had this man taken pains with his seed in the past his crop this year would have averaged at least $50 or more per acre. On a Cobbler field, belonging to the above party, I saw some of the strongest, stockiest hills of Irish Cobblers that I noted in the whole state, and could this man have been persuaded to mark what he and one man could have marked in a day's time, digging these marked hills by hand at digging time, he would have had a lot for his own seed that would have been true to name and free of disease and that would have given him, in my opinion, a third greater yield than anything he will have to plant the coming summer.

This matter of varietal mixture has been as great a source of annoyance and loss to those in the south, who have bought Maine seed, as has diseased stock. Varietal mixtures are very easily done away with by hill selection in the field. A single year's work, especially with some varieties, will suffice not only to make them true to name, but give the grower a much greater yield per acre. I have seen many fields this year that I feel sure would have yielded their owners double the crop obtained, if hill selection had been practiced for the grower's own seed.

The Irish Cobbler which, without doubt, is the one most in demand for seed south, can be gotten true to name by another method besides hill selection in the field—that is, by sunning the tubers before planting. There is in the case of the Cobbler a pigment in the skin of the tuber which will turn purple, upon exposure to the direct rays of the sun for a few days, while the Green Mountain varieties will only begin to turn a light green. Exposure of a mixed lot of these varieties to the sun for a few days will allow the farmer to pick the two varieties apart as readily as though one were apples and the other potatoes.

In the southern and central parts of the state, where there is not so much danger of late frosts, it is safe to spread them out of doors on the ground, but in Aroostook county this sunning would have to be largely done in a building, with plenty of windows to let in the rays of the sun direct upon the tubers, as mere light will not bring out the difference of color in the different varieties.

While disease is causing a tremendous loss in yield to our own growers and has caused a loss to the state of immense sums, I feel sure that it has not caused us as much loss in our seed trade as has varietal mixtures. There is no question but that disease is cutting into the production of potatoes of Maine to a much greater extent than many growers suppose. There are several of these which are not so very serious, but each will take its toll of loss in yield per acre, and the sum total makes a very great reduction. Rhizoctonia, Blackleg and Bacterial Wilt are three, at least, to which a great many growers pay but little attention, each of which cuts down the yield and the sum total of the three makes the difference between profit and loss to more fields than is generally supposed.

Thirteen years ago I spent the summer carrying on potato experiments at Caribou. At that time Mosaic was unknown in the county, but has since spread over the whole state, there being but few fields of the Green Mountain varieties in 1915 which were free from it. It does not seem, as yet, to affect the Irish Cobbler to any great extent; but the Red Bliss, a potato of similar vine growth, has been very nearly driven out of the state by it. From my observation it is thought that there are hundreds of acres of the Green Mountain varieties in which the yield was cut down at least forty per cent the past season by Mosaic alone. Many farmers suffering this loss did not even know to what to ascribe their poor yield. This is one of the diseases on which the growers need instruction and is one of the hardest to control, with the present knowledge of it. At present there does not seem to be any way of combating it, except by selection of those hills which show no traces of it and saving the product of these for the next season s planting.

A more general knowledge of the value of the high producing individuals, found in any variety over the run of the field, with a better understanding of the potato diseases mentioned above, will greatly help the work of the Seed Improvement Association and this Department.

The entries for certification came largely from Aroostook county the past season and it was found necessary to have a corps of six inspectors, under charge of one man, in order that the work might be properly done. The inspection work was started about the middle of July with the following inspectors: Chas. Ruffner of Orono, E. S. Russell of Vinalhaven, Samuel Guptill of Topsham, Donald Campbell of Island Falls, Lewis Kriger of Portland and C. A. Jones of China, who acted as chief in charge. Mr. Jones, having had charge of the United States Horticultural Board of Inspectors during the inspection for Powdery Scab, came well fitted by training and experience to carry on the work of inspection in a broad way. It was found necessary to secure a Ford automobile in order to carry on the work quickly and cheaply, as the time saved in getting from one farm to another made a saving of at least the work of two men.

The work in Maine, outside of Aroostook county, was done by two inspectors, with the help of the secretary of the association. There were James Cook of Brunswick and Boyce C. Thomas of Westbrook.

Some few fields of the Green Mountain varieties were found in central Maine that were free of Mosaic and it is expected that in the season of 1916 what fields are found in the state free of this disease will be in the central Maine section.

It seems probable that a further study along this line will become of great importance the coming season, and with the co-operation of Dr. Morse, Plant Pathologist, at Orono, who is very much interested and has extended this office and the Seed Improvement Association all the aid possible, it is hoped that nearly all of the fields entirely free of this disease may be located and, if true to variety, be kept within the state for our own farmers to plant. The work in 1916 should be made more self-sustaining and the price per acre for inspection has been raised by vote of the executive committee of the Maine Seed Improvement Association.

The applications for entries in Aroostook county were much larger than was expected, yet it seemed that there was a misunderstanding among the growers as to what the work was expected to accomplish. Many who made application to enter for certification evidently did not take any pains to see that the seed they planted was anything more than the common run of their bins. So large a portion of these fields had to be disqualified that it was found cheaper to send a man to make a preliminary inspection before they were accepted for entry for certification, as, otherwise, the corps of inspectors would make a trip to the farms only to find, after a few minutes' work, that the field was hopelessly disqualified. This caused so great a loss of time that the preliminary inspection was invoked and hundreds of acres given this inspection were not accepted for entry. As it did not seem at the time advisable to keep a record of what was not actually entered, the office has no account of the amount of the work done in this preliminary inspection or number of acres refused entry, nor the miles traveled in this work. The inspectors were instructed, as far as possible, to acquaint the growers with the reasons for refusing to accept their fields for entry and a large amount of instruction was given in this way.

There were 1,194 acres which were accepted for entry in Aroostook county, or rather, which passed the preliminary inspection. Of these, 1,157 acres had the final inspection and 1,091 were paid for; 620 acres of these were Irish Cobbler, 82 acres Spaulding Rose, 28 acres of Green Mountain, 27 acres of Gold Coin, 20 Ehnola, 15 Early Eureka and two acres of Comet.

Outside of Aroostook county there were entered, of all crops, 527 acres. Of these, 372 1-2 acres were potatoes, 17 1-2 were corn, 24 1-2 beans, 90 1-2 oats, 12 wheat, 19 1-2 barley, one of buckwheat and one of peas. A large portion of these were withdrawn, owing to the damage done by heavy rains previous to the arrival of the inspectors; another large per cent was disqualified, mostly for the same reason. There were finally passed 131 acres of potatoes, 18 acres of oats, seven of barley and three of corn. The total number of bushels of potatoes entitled to certification here in Maine in 1915 were, approximately, 200,000. Wisconsin had 56,000 bushels, mostly Green Mountain and Rural New Yorker varieties, not so much sought after in the south for seed as is the Maine grown Cobbler, Rose and Hebron.

The experience of the past year shows that the work of seed improvement by state inspection should be as near self-sustaining as it is possible to make it. There is seldom any real good comes from any work unless those who benefit by it are interested enough to pay the cost. Moreover, it seems to be impossible to so teach the growers the responsibility that rests upon them in the grading and sorting of seed potatoes, entitled to certification, that they may be a continual advertisement of our best Maine seed. With this idea in view the secretary has presented the following recommendations, to the officers and the executive committee of the Maine Seed Improvement Association, as to the fees to be charged for the work of seed inspection for the present year:

Rule 1. There shall be an entry fee of 50 cents per acre on all crops, payable when the entry is made.

Rule 2. An additional fee of $2 per acre be paid on all that pass the two field inspections and the crop judged fit for certification.

Rule 3. That a fee for tags be paid on a basis of one and one-half cents per bushel for potatoes payable at the time the inspector attaches the tags to the container.

Rule 4. That no tags be left with the grower, but all kept in the hands of the inspectors until the inspectors themselves shall attach to the containers; each tag to be signed by the inspector in his own handwriting, thereby making certain that the complaint of poorly graded stock can be traced directly to the inspector responsible for letting it go out. This rule to apply to all crops.

Rule 5. That each inspector shall supply a copy of his signature to the President of the Seed Improvement Association and the Department of Agriculture.

Rule 6. That as it is only necessary to make one field inspection of small grains, like oats, barley, wheat, buckwheat, etc., that a fee of $1 per acre be charged in addition to the entry fee of 50 cents per acre—the cost of tags to be on the same basis and under the same rules as potatoes.

Rule 7. That all crops, where it is necessary to make two field inspections while growing, pay the same fees per acre as potatoes and the same for tags.

If the work is carried out on this basis there can be no doubt that great benefit will accrue to Maine agriculture, especially to the potato growers.

Respectfully submitted,

E. A. ROGERS,

Assistant Dairy Instructor.

REPORT OF STATE DAIRY INSPECTOR.

To Hon. W. T. Guptill, Commissioner of Agriculture:

I respectfully submit my report as Dairy Inspector, from March 8, 1915, when I was appointed, to Dec. 31, 1915.

When appointed to the office of Dairy Inspector, the work was supervised by the Chief Bureau of Inspection, and I worked as a Deputy Inspector under him until September 1, when I took complete charge of Dairy Inspection.

At the beginning of the year the quarterly Dairy Bulletin, "Investigation of Dairy Products," was temporarily transferred to the Maine Agricultural Experiment Station, at Orono, for publication. The publication of this bulletin remained at Orono until September 1, when it was brought back to this office. Therefore, the bulletin, "Investigation of Dairy Products," for the last quarter of the year 1915, is the only bulletin I have published. As well as the report of analyses, this bulletin contains two articles under the titles, "Scope of Dairy Inspection" and "Cooperative Inspection." The only dairy bulletin published by the Experiment station was a bulletin, "Official Inspection 71," entitled "Cream and Milk," which was published in July, 1915. At the request of Director Charles D. Woods, I prepared an article, "Clean Milk Production," for this bulletin.

From March 1 to June 1, my time was spent taking samples of milk and cream to be analyzed at the Maine Agricultural Experiment Station, at Orono, to determine whether or not they were up to the standard required by law.

The first week in June was spent in preparing the Agricultural Exhibit at the Maine State Exposition and the two weeks following I was at the Exposition which was held in the Exposition Building at Portland, June 7 to 19.

During the latter part of June, July and the first of August, I took milk and cream samples from time to time, but spent the most of my time investigating the butter conditions, concerning the net weight law. I found that very little attention was being paid to this law and now feel that the time I spent making this investigation has accomplished a great deal of good, as in every market in the state one may find dairy butter legally stamped with its net weight, thus protecting the consumer, the dealer and the honest manufacturer of dairy butter.

On August 11, the Agricultural Fairs opened with one at Belfast, and I spent August, September and part of October as your agent at several of the fairs.

Time that was left between fairs was spent in the usual way, by taking milk and cream samples. I carried the dairy exhibit to the Central Maine Fair at Waterville and to the Maine State Fair at Lewiston. Milk and cream contests were conducted at these two fairs, and assistance was given by Russell S. Smith, Dairy Division, Department of Agriculture, Washington, D. C., who scored all the dairy products. At the Maine State Fair I conducted the Fat Production Contest.

During October, I accompanied Dr. Herman C. Lythgoe and Dr. Eugene Kelly of the Massachusetts State Board of Health and others of this department, on a three days' overland trip from Portland to Pittsfield, Maine. We visited many creameries and many dairy farms on this trip. The creameries were inspected for their cleanliness of method, and the dairy barns were subjected to the United States score cards.

The remainder of the year was spent in collecting milk and cream samples.

The results of the analyses of the samples of milk and cream taken between March 8 and September 1, 1916, are as follows: Whole number of samples taken, 542; number found above standard, 519; number found clean, 287; number containing visible sediment, 255; number below standard in fat, 9; number below standard in total solids, 14; number skimmed, 4; number watered, 1.

DISPOSITION OF VIOLATIONS.

Warned and placed on probation by this Department	8
Given hearing and fined	1

Result of the analyses of the samples of milk and cream taken during last quarter of the year 1915 are as follows:

Whole number of samples taken, 253; number found above standard, 246; number found clean, 145; number containing visible sediment, 108; number below standard in fat, 7; number below standard in total solids, 4; number skimmed, 2; number watered, 0.

VIOLATIONS.

The settlement of the seven cases of violation, occurring during the last quarter of the year 1915, are as yet pending.

EDUCATIONAL.

It will be understood from the data just preceding that during the entire year, 1915, there has been only one fine paid. This fact alone shows that, as far as the standard set by law goes, dairy inspection has been a success. This one case which was settled by a fine was a case of under standard cream.

The dairyman or dealer selling cream can control the percentage of fat in that cream by proper adjustment of the cream screw in the separator. Therefore, any case of under standard cream can be blamed to no one but himself and, consequently, all such cases should be prosecuted.

On the other hand, the dairyman cannot always control the percentage of butter fat in low grade milk. In the majority of violations the analyses have shown that the milk has been normal milk, from cows whose characteristics are to produce milk low in the percentages of fat or solids not fat or both.

Dairymen or dealers of whom such samples were taken were warned that their milk was under the standard required by law and were advised to rid themselves of the low producing cows which were keeping the test of their herd milk below standard.

Throughout the entire year inspection has been brought about by persuasion rather than by prosecution.

The remark that the pump is the dairyman's best cow is a statement of the past. In the last few years many dairymen who seemed unable to sell milk without watering it have gone out of business, much to the gratification of all concerned. Perhaps there are a few more such dairymen left, but they are few indeed, and if we can rid the state of all such dealers we should be satisfied, even without accepting fines for the violations.

When in different parts of the state collecting milk samples I have visited as many dairy farms as possible and inspected their barns, equipment and methods. The United States score card was applied in almost every case with the object of educational advantage to the dairyman, rather than in the spirit of finding fault. I find that the dairymen are very eager to co-operate with this type of inspection. It is, however, impossible to do a great deal of this sort of inspection under the present appropriation.

However, the inspection at the source of production, if properly done, is the proper method of bringing about improvement in the sanitary quality of dairy products.

This statement has been proven by the fact that the sanitary quality of milk, from the dairy farms that have been visited and inspected, and whose owners or managers have eagerly received suggestions to improve their methods of production, has improved to a marked degree.

Therefore, as your report goes out to farmers largely, I wish to have re-published the article, "Clean Milk Production," which appeared in the "Official Inspection 71," published in July, 1915, by the Maine Agricultural Experiment Station. The suggestions herein contained are both practical and economical.

CLEAN MILK PRODUCTION.

If milk could be drawn direct from the cow into sterile bottles without its passing through air it would be practically free from bacteria. This, however, is impossible and impracticable. It is very evident, therefore, that milk becomes contaminated after it is drawn. Although bacteria are too minute to be seen with the naked eye, we really mean bacterial infection when we speak of filthy milk. Whenever any amount of sediment is seen at the bottom of a milk bottle it is enough to say that there are many bacteria in such milk, for dirt and bacteria go hand in hand. Every speck of dirt, every particle of dust, every piece of hair and every insect that falls into the milk carries with it several thousand bacteria.

The bacteria content of milk depends upon various factors of which the following are most important:

Dirty or unhealthy cows.
Dirty stables.
Dirty or unhealthy persons employed in handling cows and milk.
Dirty utensils.
Dirty surroundings of milk after being drawn.
Keeping milk at high temperature.

DIRTY OR UNHEALTHY COWS.

When cows are not properly cleaned every day a great amount of loose hair and coarse dirt accumulates on their bodies, and every piece of hair or dirt that falls into the milk pail carries with it a large number of bacteria. It is true that the hair and large particles of dirt may be removed by the strainers, but the bacteria have been washed from them and it is impossible to remove them by straining.

DIRTY STABLES.

Dirty stables, by which is meant, stables not properly cared for, having dirty floors, walls, and ceilings, favor the contamination of milk. The walls and ceilings of stables should be made of matched lumber so that they are tight. They should be frequently cleaned and whitewashed. When this is done the amount of floating dust in the stable is reduced to a minimum. Dust and bacteria are closely associated. Hay or other dry fodders causing dust should not be fed until after milking.

DIRTY EMPLOYEES.

All persons employed to take care of the cows or the milk should be dressed in clean suits made of some hard material that will not collect dust and dirt. The hands of the milker should be thoroughly washed and dried before milking. He should be furnished with a clean white jacket which will not collect dust and which will show dirt easily if it does accumulate.

DIRTY UTENSILS.

Great care should be used to keep milk pails, strainers and milk cans clean. Cracks and joints in pails and cans form a very good hiding place for dirt and hence bacteria. It is well to flush all joints and seams with solder before using a new pail or can. Some form of narrow top pail should be used. They decrease the amount of surface open to dust particles in the air and hair of the cow. The form of narrow top pail that has a strainer attached is not considered sanitary, because all hair and dirt that falls on the strainer is thoroughly washed by the milk that follows. Even if the hair and dirt are not washed through the strainer into the milk, the bacteria from them are. Strainers should be thoroughly cleaned and scalded after being used and as soon as they become soiled and filled with hair, should be thrown away. Pails and cans should be cleaned after being used and should be scalded with boiling water or live steam before being used again.

DIRTY SURROUNDINGS.

Even when milk has been drawn in accordance with the previous precautions, it is very easily contaminated if kept at any length of time where it is not clean. Hence, as soon as one cow is thoroughly milked the milk should be removed from the stable at once to a clean milk room where it should be immediately strained.

KEEPING MILK AT HIGH TEMPERATURE.

The keeping quality of milk depends to a large extent upon the growth of bacteria after it is drawn. Warm milk forms an excellent medium for the growth and development of bacteria. Therefore, it is important that milk should be thoroughly cooled while the bacteria content is low. Cooling should be accomplished immediately after straining, by running it over a cooler filled with cold spring water or ice. If a cooler is not at hand the cooling can be done by setting cans of milk in ice water. If this method is employed the milk should be stirred from time to time to insure that it is cool. If a cooler is used it should be placed in as pure an atmosphere as possible to prevent contamination. The temperature of new milk should be reduced to at least 60° F. in order to retard the growth of bacteria commonly found in milk. It is not only essential to reduce milk to this temperature, but also to hold it at this low temperature until delivered to the consumer.

After milk has been delivered it belongs to the consumer and even if it has been produced under the best of conditions, its keeping quality from then on depends largely upon its treatment by the consumer. Milk should not be left on the door steps where the sun will raise its temperature to the point where bacterial growth is greatest, from 70° to 90° F. This high temperature may even sour milk in a few hours. The milk should be removed from the sun at once and placed in a refrigerator where its low temperature may be maintained.

RECOMMENDATIONS.

In order to improve our dairy and milk supply of the State of Maine to the degree that public sentiment is asking that it be improved, I make the following recommendations:

Licenses.

I recommend that a fee of one dollar, or some such amount, be placed upon milk licenses. There are approximately 4,500 licenses issued every year and this small tax would amount to as much, and perhaps a little more than, our annual appropriation.

Many dealers have little or no regard for a license because it is free from cost.

Further inquiries regarding the method of producing milk will, in a measure, help to control the sanitary quality of the dairy supply.

The only questions regarding the sanitary condition of milk, asked on the application cards for licenses, are relative to tuberculin tested cows and to delivery in cans or bottles. Further inquiries regarding the method of production should be required of every producer before a license is granted.

Dairy Inspection.

Every dairy applying for a milk dealer's license should be systematically inspected. This inspection should be done by properly qualified inspectors, or rather instructors, with the ability to impart to the dairy farmer advice regarding the economical production of sanitary milk. Additional inspectors would, of course, be necessary to carry out this recommendation. Therefore, it is an impossibility, under the present appropriation.

Conclusion.

Throughout my report there is evidence that dairy inspection is limited in its work, due to the small appropriation of $4,000 a year. Many of my recommendations are impossible unless the appropriation becomes greater. However, I trust that the feeling aroused in some of our larger cities, demanding "cleaner" milk, will stimulate an action that will bring about a larger appropriation by some future legislature. Ten thousand dollars can easily be used in this work.

I wish at this time to thank you for the courtesies shown me and for your untiring aid and advice. The clerical and other members of the Department have rendered their willing services at all times.

Respectfully submitted,
CLIFFORD W. WESCOTT,
State Dairy Inspector.

Bearing Baldwin tree, four year set.

REPORT OF STATE HORTICULTURIST.

To the Honorable William T. Guptill, Commissioner of Agriculture:

I herewith submit my fifth annual report as State Horticulturist, for the year 1915.

In many ways this report will be of a depressing nature, inasmuch as conditions have been far from favorable for the production of satisfactory crops. The weather conditions this season were most unsatisfactory and as a result the crop of fruit and small fruits was of poor quality and very much limited in quantity. Most of the snow disappeared in the latter part of February, and with a fair March and little frost in the ground everything pointed to a very desirable season. The bloom was heavy, but in the latter part of May and the first week in June we had frosts and a freeze which damaged the fruit crop fully fifty per cent. Summer was very wet and the frequent and continued rains not only damaged the little fruit that was left, but also made it almost impossible to give adequate protection from pests by spraying. The picking season was very satisfactory, but the harm had already been done and it was too late to look for any quantity of good fruit.

Because of the season and the small amount of fruit, there was quite a considerable falling off in spraying on the part of the growers with the possible exception of the dormant application. There was more or less winter-killing not only to fruit trees, but also to ornamental shrubs and shade trees due no doubt to the lack of snow for the greater part of the winter.

With the crop estimates showing a decided falling off from last year, high prices for fruit began to circulate early and many buyers paid $2.75 to $3.25 per barrel. As has been mentioned before, the fruit was of very poor quality, so that when fruit arrived on the market, the demand was sluggish and prices were not greatly superior to last season. At this time it looks as if good fruit would command a very fair figure later on, but it is a question in the mind of the writer whether or not fruit will stand up in storage.

The continuation of the war in Europe resulted in a relatively small export trade, although prices on the Liverpool market would have been very satisfactory in normal seasons. Freight rates covering transportation to English markets started in the vicinity of a $1.25 per barrel and have now reached the figure of $2 per barrel, with only limited space. Some of the more fortunate growers and associations have been able to secure space for $1.25 per barrel up to the first of January. Much of the Canadian fruit has been shipped through American ports and they have offered in some instances a bonus of from 20 to 50 cents a barrel for ocean space.

Insects and Diseases of Fruit and Tree.

Railroad Worm. While we have experienced more or less difficulty in the control of this insect for the past several years, it would seem that the percentage of damage done during the past season is the greatest yet experienced. A successful way of protecting the fruit from this pest is yet to be realized. Last year the so-called sweetened spray made by adding a gallon of molasses or a certain amount of some sweet material to fifty gallons of arsenate of lead mixture proved very satisfactory. When it was time to spray this year, that is, while the flies were hovering about the trees before laying their eggs, the continued rains made it almost impossible to apply the mixture and hope for any satisfactory results. No doubt under normal conditions this sweetened mixture will prove a very valuable asset in our spraying operations, but in such season as this it would seem to be of little benefit. The impracticability of controlling this insect by picking up the windfalls when the orchard is located in the immediate vicinity of another where the windfalls are not picked up has been already plainly demonstrated, and it is only by the cooperation of all growers in picking up the drops that any real benefit may be derived.

In addition to the varieties commonly infested we find the insect working more or less extensively in the Baldwin, Stark, Spy, King and several other varieties.

Green Aphis. The aphis infestation has seemed to be rather below normal and the growers have not experienced as much trouble with this pest as during the past few seasons. This was especially noticeable with the young trees.

Borers. In a recent bulletin on the Round Head Borer, a government expert has recommended as a remedy the use of a rather heavy lead and oil mixture applied to the butt of the tree to the height of eighteen to twenty-four inches. If this method does not result in any harm to the tree itself, it would seem to be the simplest and most efficient thus far advocated. The painting would have to be done each year. We know, of course, that tarred paper or any similar material, if kept on for the entire year, stifles the evaporation from the bark and does not give a free circulation of air so that we have first a blackened condition, usually followed by disease infection. If the paint does not give a similar result, it is surely a welcome remedy. The best remedy in operation at the present time is the fine mesh galvanized wire wrapped around the tree, carefully, that it may not brush the tree in any part, with one end well covered in the ground and the other stuffed with cotton or waste. In some cases the borers will lay their eggs at the top of the wire, but the number is small, and the infestation is easily noticed. The reason for so much care in not allowing the wire to touch the tree is because of the tendency on the part of the female borer to insert the egg through the mesh of the wire.

Leaf Blister Mite. This exceedingly active mite is making its presence known in orchards where there is no spraying done, or, if done, where the application has been carelessly applied. The only time during its life history when it is vulnerable is when migrating from its winter home between the folds of the leaf-bud to its summer home between the surfaces of the leaf. It does not begin to move about until the leaf-buds have begun to swell appreciably, so that it is very necessary in order to control this pest to apply the dormant spray of lime-sulphur rather later than is commonly practiced. The tips of the leaf-buds should show a decided green, and little or no harm will be done if they have become a quarter of an inch in length.

It is a sad sight in the fall to see apple trees, particularly the Baldwin, with their leaves all turning yellow and dropping off when they should be hard at work transforming the sap into food products for storage in the tree. It would seem almost as if this severe drop must have some effect on the fruit buds for the following year.

Crown Gall. After reading experiments of various authorities showing in some instances disastrous results to the trees infected with Crown Gall and in other instances negligible harm, the writer will have to admit that he is somewhat at a loss to understand whether or not the disease is a serious one. The bureau has always taken the stand that infected trees should be condemned and has urged the growers to throw out all trees showing this root gall. During the past season, only a very few cases of infection on nursery stock has come to our attention, so that it is reasonable to presume that most nurseries are ridding their ground of the disease.

Sooty Blotch. On different occasions we have noticed how this disease can injure the sale value of our fruit, but perhaps not until this season have we understood to what extent this damage may spread. Usually this disease has confined its attention to small sections and more particularly to the fruit grown on trees where there has been little or no pruning, and no spraying. This year the infection is very general, due, of course, to the long rainy period while fruit was maturing, and to the fact that our spraying has not been as effective as heretofore. One grower after examining his apples in storage is led to believe that the disease has penetrated the skin, although he is not certain but that some other disease is at work in conjunction with this blotch. Scientists have always maintained that this fungus does not penetrate the apple, but simply spreads over the surface. We do know that it is much harder to rub off after the apple has been picked some time than when fresh from the tree. Damp weather and heavy foliage where there is little opportunity for circulation of air through the tree are favorable factors in the disseminating of this fungus. Probably this disease alone has resulted this year in an average net loss of at least 25 cents per barrel, or a gross total of more than $25,000 for the state.

Leaf Spot. With the abundance of canker (Sphaeropsis malorum) existing in our orchards, it is not surprising to note the appearance of leaf spot caused by the same fungus, when

Heavy yielding Baldwin tree, C. A. Frost, Wales.

conditions are more or less favorable to its development. Many orchards were noted this year where the leaves were almost all of a yellow color early in the season due to this fungus. As in the case of the blister mite such a condition results in the lack of proper nutrition for the tree through the leaves failing to perform their proper function. The scab spray of Bordeaux mixture or lime-sulphur is very essential to the control of this disease, although proper fertilization and general care are important factors. Trees that are thrifty are not as susceptible.

Scab. The writer will have to admit that the operations of this fungus are amazing. We know, in a general way, that wet weather is favorable for its development, yet with the abnormal conditions we have experienced this season the percentage of infection is relatively low. It is true, of course, that in some sections much fruit has been damaged, but in general the infection is smaller than we would naturally expect. We certainly have a good deal to learn about scab and the factors governing its dissemination and growth. It may be that the rather dry fall of 1914 and the dry spring of this year held the fungus in check, in any case, until we know definitely, one guess is as good as another. For control measures it is being clearly demonstrated that the dormant spray is very important and that Bordeaux mixture is superior to lime-sulphur as a pink bud application. This holds true, of course, for the prepared copper materials such as Pyrox, Bordo Lead, etc. Clean cultivation, by turning under many of the infected leaves, no doubt helps in keeping this fungus in check.

Baldwin Spot. It is now generally realized that the spot on the Baldwin and several other varieties which materially reduces their commercial value is not due to fungus origin. Just what is the cause of this condition is not known, although many growers maintain that excessive amounts of nitrogenous fertilizer invariably bring it on, and that lime is a checking agent. Whether or not this is true the writer is unable to say for the spot is found on the fruit of trees entirely neglected as well as on those grown in hen yards and other places where the amount of nitrogen is out of proportion to the actual needs of the tree, and where the soil is decidedly acid.

Winter Injury. When growers realize the absolute necessity of checking the growth of the tree early in July and allowing the new growth sufficient opportunity to ripen and mature, and when they realize the importance of an early and rapid start in the spring, then we may hope for a small percentage of winter-kill. Of course it is a pleasant sight to have the trees growing rapidly throughout the summer months and to note in the fall two, three and four feet of new wood, but in such a system where is the advantage if much of this new growth and some of the old and in some cases the entire tree is lost by excessive drying out of the tissues? It was especially noticeable in the recent Gregory Orchard Contest that the trees making phenomenal growth the first two years failed to continue this rapid development, while those making a normal growth each year were far superior at the end of the contest. With the cultivation system, a cover crop should be applied some time in the early part of July for bearing trees and at least by August for young trees. The cracking of the bark on the trunk of the tree is a different matter and due primarily to rapid changes in temperature, but there is little danger of losing a tree in this way if the grower attends to them and sees to it that they are given every opportunity to heal.

Canker. This disease has been cussed and discussed so many times that there seems to be but little to add concerning it. The process of elimination and control where the infection is heavy is a slow one. The condition of the tree must be noted at frequent intervals and it is well to keep saw and knife sharp at all times. More careful attention to the spray materials and to the machinery is necessary for it is only by the most conscientious attention to detail that success in control will be realized. It seems safe to say that the condition of the average orchard at the present time is more satisfactory than for several seasons past, but the time is still distant when we can point to the trees and say that they are absolutely free from this disease. The infection has been due to several factors, many of which are under the direct control of the grower. Probably in the past the pruning-saw has been as potent a factor in disseminating canker as any we have had to contend with. Carelessness in going from an infected tree to a non-infected tree without disinfecting the saw has resulted in an enormous damage to our trees. Failure to properly protect wounds has given the organism a chance to spread and develop until it is a continued struggle on the part of the grower to hold it reasonably in check.

Small Fruits.

Strawberries. The quality of the strawberry crop this year seemed to be somewhat below standard. They were of good size and normal color, but seemed to lack the texture and flavor which have made them an essential to the diet during their season. Weather conditions were of course responsible. The vines this fall are particularly vigorous and we should look forward to a bumper crop next year. Many of the growers are planting the fall fruiting varieties in a limited way—thus far with much success. Many varieties have been tested and the most desirable seem to be the Superb and Progressive. Prices for these berries have ranged from 20 to 50 cents per quart, and the demand has been greater than the production. What will be the result when there is a big supply of these berries is a question, but certainly there is an opportunity here at the present time. Probably the yield from such berries will not equal that of the common sorts, so that it will always be necessary to receive a higher figure in the marketing of them. Plants have been hard to get, especially those grown locally, presumably because the growers hesitate to pass such a good thing into general circulation.

Raspberries. There was severe winter-killing with the raspberry canes last winter, especially with the Cuthbert variety. The Herbert seemed to stand the adverse weather conditions in a much more satisfactory manner and while not the equal of the Cuthbert as a berry there is no doubt but what it should be adopted more generally as the standard berry for Maine. The everbearing St. Regis appears to have some advantages, but there does not seem to be the opportunity here for such a berry as there is in the case of the fall bearing strawberry. In regard to the winter-killing of the cane it was especially noticeable that the laid-down canes suffered fully as much as those left standing. This was due, presumably, to the snow disappearing so early and leaving the canes exposed to the weather. During the warm periods the leaf-buds started out and were later killed by the cold. It would seem that the leaf-buds on canes left standing did not start as early, consequently did not suffer in proportion. As in the case of the strawberries, the quality was rather inferior.

Gooseberries. For several seasons the gooseberry crop has been decimated by a severe drop due to sun-scald early in July. This was probably due to some extent at least to lack of sufficient foliage. The pruning of the gooseberry has been seriously neglected, for in order to supply the proper amount of leaf surface it is necessary to cut back the plants rather heavily and incite a new growth of wood. Some of the growers have planted fruit trees along the rows to supply shade, but this is not entirely satisfactory as the shade is not supplied during the hottest part of the day, and results often times in shutting off what circulation of air there may be. The Chautauqua in a great many ways seems to be a superior berry to the Downing, especially in the matter of size, and the market takes to it very kindly.

Blackberries. It has always been a matter of wonder to the writer why No. 1 blackberries are not received in better favor on the part of the consuming public. When properly grown and handled it is hard to conceive of a berry with superior flavor and general lusciousness. The reason for this indifference must be due largely to the relatively small supply of fancy fruit handled by the distributors, for it is painfully apparent that the general run of blackberries on the market is of inferior quality. Many such berries are gathered from roadsides and pastures from volunteer plants which receive little or no care. When well fertilized and planted upon good, rich soil, we have an entirely different berry and one which to my mind cannot fail to please the palate. Immature, sun-dried, worthless fruit never should be placed upon the market, but under the circumstances, where the cost of picking is the only expense connected with such fruit, we shall probably, like the poor, always have them in our midst.

Currants. Like the gooseberry, and of course all other fruits, the currant responds very readily to good culture, and when planted in favorable soil, fertilized and given good treatment, we have a very luscious fruit. With the number of summer visitors who annually spend their vacation in this state, we certainly should increase our small fruit planting. An effort should be made to supply berries in rotation through the summer at reasonable prices, so that the desire for such fruit shall be constantly increasing. In this rotation the currant has its place as fresh fruit and as a by-product in jam, jelly. conserve, etc.

Our growers have been troubled very little with mildew as yet and the worst pests that we have to contend with are the gooseberry fruit-fly and the currant worm.

Probably the biggest handicap to the production of all small fruits on a larger scale is the lack of cheap labor available for picking purposes. No doubt in sections suitable to the production of small fruits, and there are many in this state, cooperative associations could be formed to very good advantage, and help out especially in looking after the labor situation, and in grading the product.

Auburn Fruit Conference.

The third annual conference of the fruit growers of western Maine was held in Auburn on February 23, 24 and 25, 1915, under the direction of the Department of Agriculture, Auburn Fruit Growers' Association, and Auburn Board of Trade. Unfortunately the weather conditions were most unfavorable, so that the attendance was not as large as had been hoped. Nearly 375 people registered and many growers were present during the entire session. More of the local men were utilized in the program than at the former meeting, but we had several speakers from outside the state including I. I. Margeson of Westwood, Mass., John C. Orcutt of Boston, Mass., and G. V. Branch of Washington. The Round Table discussion was very successful and much real benefit was derived from it. A few of the discussions and lectures are printed in this report for the benefit of those who were not present and for reference to those who were there. Following is the program:

Tuesday, February 23, 7.15 P. M.

Registration.

Address,	Hon. A. W. Fowles, Mayor of Auburn
Address,	H. L. Keyser, Greene
Small Fruits,	I. I. Margeson, Westwood, Mass.

Wednesday, February 24, 9.00 A. M.

Round Table Discussion.

Dynamite in Planting, T. E. Chase, Buckfield
Varieties for Maine, Prof. E. F. Hitchings, Orono
Sprays for Aphis, Frank Mitchell, Waterville
Annual Bearing of Fruit Trees, W. H. Conant, Buckfield
How and When to Thin Apples, G. A. Yeaton, Norway
General Questions.

2.00 P. M.

Factors in Marketing and Increasing the Sale of Apples,
John C. Orcutt, Boston, Mass.,
Secretary Agricultural Committee, Chamber of Commerce
A Few Things That Will Help Our Market,
A. E. Jennings, Auburn
Our Local Market, E. A. Bickford, Auburn

7.30 P. M.

Supper.
Speaker of the Evening, Dr. L. S. Merrill,
Dean of Agricultural College, University of Maine,
Orono, Maine

Thursday, February 25, 9.00 A. M.

Round Table (Continued).

Apples in Bulk, C. E. Wheeler, Chesterville
Marketing Fancy Apples in Maine, E. E. Conant, Buckfield
By-Products, H. P. Sweetser, Cumberland Center
Catering to Trade Demands, H. L. Keyser, Greene
Cooperative Buying, C. E. Embree, Bangor
What Are We Going to Do About It?
Prof. B. S. Brown, Orono

2.00 P. M.

Cooperative Organization, G. V. Branch, Washington, D. C.
Bureau of Markets, U. S. Department of Agriculture
Western Methods in Grading and Packing Apples,
J. G. Johnson, Portland, Maine

ADDRESSES GIVEN AT THE AUBURN MEETING

HOW AND WHEN TO THIN APPLES.

G. A. YEATON, Norway.

(*Stenographic Report.*)

Mr. Chairman, Ladies and Gentlemen:

There was a good woman who had always been doing good to every person with whom she came in contact. When she came to die, her husband ordered engraved on her stone, "Lord, She Was Thine." There was not enough room for all the letters, the engraver found, so when the stone was finished, it read, "Lord, She Was Thin." I am going to talk a little about thinning. I don't think that thinning is a panacea for all ills, or will make a tree bear if it is naturally a sterile bearing tree, but it does have a tendency to bring those trees into natural bearing.

In 1913, the state laws were amended so that if we were going to sell, we had grades established by law. The fancy grade was to be apples of one variety, well colored, and not less than two and one-half inches; No. 1 of one variety, well colored, and not less than two and one-quarter inches. To produce apples of this kind, we should take care of our trees. We should do the work at the right time and in the right manner to get results. There are many of us who have felt that if we did a good amount of pruning in the spring that it wouldn't be necessary for us to do any more, as that would take care of it, but I tell you right now that it will not. If we give the trees a rigid amount of pruning in the spring, it has a tendency to produce an over-amount of wood growth, which is at the expense of the fruit developing.

I will give you a bit of an experience made by my class, as we are simply telling our experiences. In 1908, I made an experiment in a Wealthy orchard which was located just a little way from home. It had quite a large lot of healthy trees. We selected 20 of them for a demonstration. Ten were thinned. The result was very satisfactory. We left the other ten in a block. These trees were as near uniform size as we could select. Apparently the ten rows that were thinned were as well loaded as the ten that were left. We thinned those apples about six inches apart. Well, those that we did not thin there was an over-growth. There were a great many apples found that were under-sized. On the others we began the thinning June 20, because at this time we thought the June drought was practically over. We went through these very carefully, leaving the apples about six inches apart. The only thing one can do is to use his judgment, and it is a matter of experience. That is the best teacher we can have.

Thinning the fruit at that time of year there are no insects in the fruit that will do any damage. If you allow them to drop at that time, the apples soon wither or dry as they fail to get any nourishment, so we paid no attention to the fruit that fell. The actual time that it took us was about one hour and a half to a tree. Perhaps we spent a little more time than was necessary. We kept definite data so that we could know the actual cost and examine the results. The cost (we reckoned the men's time at twenty cents an hour) was thirty cents per tree. In those ten trees that we thinned we got very satisfactory results. Of course the thing that appeals to all of us is the dollars and cents side of the question. If we cannot make any of our work pay in the orchard, if we cannot get a new dollar for an old one, and get a good interest on that, we better not do the work. In an exact account of the time and of the results in the ten trees that we thinned we produced thirty-four and one-third barrels of apples. Thirty-three of those barrels were fancies and No. 1's. We paid no attention to anything below the fancy and No. 1 at first. We found that on one of the trees, the lower one in the row, the soil was incongenial for that tree. We saved the No. 2 apples and had one and one-third barrels. After we came to that tree we had all of the No. 2 apples that we sold. No. 1's sold for $2.75, the No. 2's for $1.50 a barrel. I figured it out after I came into the hall to be sure I was right, for they say figures won't lie, even if the other fellow does. That gave us for the 33 barrels at $2.75, $90.75. One and one-third barrels at $1.50, $2 which gave a total of $92.75 for the No. 1's. In the block of ten trees that were not thinned we had 32 barrels, a little over two barrels less than from the trees that were thinned. We sold

21 barrels of No. 1's at $2.75, leaving us 11 barrels of No. 2's which sold at $1.50, making a total of $74.25. For the thinned trees we got $92.75; subtracting $74.25 gave us $18.50. The time it took, at 20 cents an hour, was $3 and this gave us a net profit of $15.50 in cash returns. The most important part of this was the fact that those trees have borne an annual crop right along.

The block we did not thin, the following year, had three and one-half barrels. Those apples, especially on the lower branches, were small, immature and under-colored. Quite a large part in 1909 was absolutely worthless. Where they were thinned they were practically all good apples. They were sprayed, cultivated and fertilized, and the two blocks were pruned along at the same time; there was no difference at all. The condition was as near alike as two blocks of trees could be. The result has been that in the thinned block there has been a good crop every year. The block that was not thinned had a small crop in 1909; in 1910 it bore a fair crop, and since then the whole orchard has been thinned because we found there were more dollars and cents in doing so. The trees were in a more healthy and more vigorous condition. If we allow a block of trees to overbear, we have found a weakened condition. The vitality of these trees is sapped to such an extent that it allows all the diseases to which a tree is subject to enter. It is like what the Bible says about the poor—you will always have them with you. We have to do these things if we are going to have more healthy trees, and then we are going to have more dollars in our pockets.

If a man has a large orchard of 80 acres or so, it would be impossible for him, with the scarcity of help, to go ahead and do that.

Now the main thing to consider is whether we are going to grow our orchards on the intensive or extensive plan. If, as an intensive orchard, then select the best there is, the quality that will sell for the highest price, then study the individual need of the tree requirements. Fertilize to bring out the best that is in the tree. Cultivate the soil around it and you will get money out of it. The Ben Davis is a despised apple, but it has been a commercial apple. As the business increases the trees are larger, and it is only a matter of time when the buying public is going to be more discriminate. They are going to pick for quality as well as for quantity. The varieties of trees are not productive enough, but never mind; what they want is what will tickle the other fellow's palate, and he will pay for it. We want to set those trees that will produce fruit, and what the other fellow likes and will pay for. It is a business proposition to grow those apples for the local market, and it will pay to do it in an extensive way.

If, on the other hand, we are going to try it in the extensive way, simply selling by the barrel and getting out of the barrel what we can, I don't believe it will pay—not at the price we got early in the fall, anyway, but you get increased vigor, vitality and productiveness of the trees by thinning the fruit, and you get a larger apple. But the larger ones are where the profit comes in, and it is more satisfactory to show them to the other fellow when he comes to see you than it is to show him a lot of culls.

I think we were allotted five minutes, and I have taken more than that time, already.

QUESTION: How many barrels did you get from those thinned trees in 1909?

MR. YEATON: We got the best crop there ever had been, and those trees had been set 18 years, and had fairly good care. We got 50 barrels a little above the average size. In my mind, it is the size that improves in thinning.

A thing that I want to caution you against now, is, don't stand on the branches or limbs while you are thinning, because, in dropping apples you may strike some of the apples you want to leave. I would suggest that you begin at the largest space, which is by necessity at the top of the tree, and always use a light ladder. Never use a heavy ladder where you have to lean it against the tree. Use a light ladder and you can put it pretty nearly perpendicular against the outside and you can also put your foot in well, and you will not break any limbs, but if you take a heavy ladder, you will break the tender branches and are liable to injure the work.

Instead of stepping on the branches, climb up into the tree. At that season of the year the bark slips off very easily and you will injure the tree to such an extent that it would be better to keep out of the tree. If you tear the bark off, it is only a matter of time before canker and other diseases will find a lodgment and there will be an injury that will more than offset the extra profit you would get from the thinning.

QUESTION: When do you thin?

MR. YEATON: At the first thinning I wanted to be with the man, so we did a little work. At that time the apples were very small and we could see if there was any insect injury, for if there was, it would have formed, and we could see it at that time, take them off and allow the bud to develop. By taking them at that time the results were better—more satisfactory fruit earlier in the season. Sometimes it is well to make a second thinning. Those that you have left on the tree will increase in size and in that way every apple you pick will be a fancy. It is almost impossible for us to get help; that is the only thing. We are working with sweet corn, potatoes and other crops, and our haying is coming right at this time when we should be thinning. We have not 20 men in the state who are specializing in orcharding. The thinning comes at such a time that it is impossible for us to get the required amount of help.

QUESTION: Is it necessary to pick up the apples after they are one inch and a half in diameter?

MR. YEATON: No, at this stage there is no need. The worms are at an immature stage. When the fruit begins to wither the food supply for the worm is exhausted, and it does not mature in a withered apple.

BY-PRODUCTS.

H. P. SWEETSER, Cumberland Center.

(Stenographic Report.)

Mr. Chairman, Ladies and Gentlemen:

I feel that the subject of By-Product of Fruit is a subject that should have more attention paid to it in this country, and I am sorry that you have not been able to find a man more experienced, because I am not a manufacturer of by-products, and have not been connected with that work.

I want to say that, because this is a general fruit meeting, I would like to devote just a few moments to the discussion of by-products. As you all know, the consumption of the by-products has come to be an enormous business in itself, because of its many uses. By-products are used to flavor ice cream and ices, and are found in various productions that we get at our fruit stands, including punch and other drinks that are made from the fruit juices that have been concentrated with water. We not only have fruit syrups, but we have evaporated and candied fruits made from these by-products. In the western part of New York state a great deal is done in the canning and evaporating of some of our small fruits.

We have quite a proposition on our hands if we handle this in the same way we try to handle fruit in the local markets. If you have an opportunity to dispose of small fruits for the manufacture of by-products, make up your mind that you must produce that fruit at reduced cost on the present methods. This will have to be done largely in the methods of harvesting and in the selecting of varieties. We can produce a large crop of fruit, but the principal part of the work comes in gathering, we can cut down the cost more here than anywhere else. I will cite you just one example: Where they raise raspberries for canning purposes, they harvest in one or, at the most, two pickings. They harvest all of their fruit by using what they call harvesting pans and paddles. They hold the pan in the left hand and beat the bushes with the paddle or racquet, so that the fruit will fall into the pan. In this way you can gather the fruit very rapidly and at small cost. I don't want to dwell at length upon this subject, for this is primarily an apple growers' meeting, and it seems more in line with the meeting to give the greater part of the time to the apple.

Why should we consider by-products? Simply because we must increase the consumption of apples. We have been talking for a long time about how to do this. The first and most important step is to improve the quality of the fruit. We can do this only by putting the high grade fruit before the public. We must in some way dispose of our poor grade of fruit. Aside from that reason, remember that it is very feasible and a very profitable business to use our culls and even our seconds for by-products. This would mean nothing but No. 1 and fancy fruit on the market. If we could afford that method next year, it would mean a decided increase in the profit to the apple producers of this state. A great portion of this world is not available for a fruit producer as a market. There are sections where it is not profitable to ship the raw apples, because of the excessive freight charges. However, the by-products, with the water really strained from them, may be shipped and sold at a profit.

I have a list of by-products which I plan to take up in the order I name them: Apple jelly, apple marmalade, apple butter, canned apples, evaporated apples, cider vinegar, sweet cider and apple syrup for table use as manufactured by the new patent process perfected by the United States Department of Agriculture. Perhaps it would be well to group the first three products together, for they are not so important.

We all know more or less of the manufacture of apple jelly. Apple butter is a product which is coming more and more before the public, as is also apple marmalade. These are made by adding sweet cider, vinegar and various spices to well cooked apples, then they are placed in sealed containers and put on the market. I will return to the matter of prices before I close my remarks.

Now, taking up the problem of canning apples. I was very glad when Mr. Wheeler mentioned the fact of the apple canneries in Franklin county, and it is true that in certain sections of our state men are busy making a profitable business of canning apples. Perhaps Waldo county stands second in the canning of apples at the present time. The process is not complicated. The apples are pared, usually quartered and cored. They are sterilized with steam, brought nearly to the boiling point, but not cooked enough to lose their shape, then placed in cans with a small amount of sugar. The cans are then sealed and cooked a short time in the steam retorts. They are then labeled and are ready for the public. I want to say that a process at the present time before the public is that of evaporating apples.

We have at least one evaporator in the state that is doing good work. This is in Oxford county. The process is more complicated than in the canning. As a rule, they use a poor grade of apples, although the better the grade the greater the profit to the party that is handling the apples. You can readily see how that is. If you have a well formed apple, the parer will do the work easily; while, if the apple is not well shaped, more of it will be lost in paring. The apples are brought to the evaporators in large quantities, in bulk, and are handled through the evaporators rapidly. One man operates each machine, simply feeding in the apples. They are cored, peeled and sliced by this machine, and then carried to a portion of the building where they may be subjected to sulphur fumes and bleached, which consists of driving sulphur through the room. In this room they are spread over the floor, on low tables, or trays especially fitted for that purpose. In some instances they are moved again and carried to the oven-heated rooms, which are simply large rooms with slatted floor or tables, so arranged that there is hot air or steam. This heat is delivered through the floor of the building and the apples are dried to the desired condition. The temperature is about 120° F. Men are working in these rooms, turning over the apples and seeing that they are dried uniformly. After they are taken from these ovens they are graded, usually in three grades—fancy, choice and prime. As I have said before, this is the most popular method of getting the by-product ready for the consumer. They are simply softened and used like raw apples. One other suggestion is this: In evaporating, nothing is thrown away, as the skins and cores are sent to factories where jelly is made.

I want to spend the larger portion of the remaining time in discussing the process of extracting the juices from apples. We will just take up the subject of vinegar, a subject that most everybody knows about, but perhaps I can give you something new on the subject. Vinegar is an acid product made from fermented apple juice and used as a condiment for table use, or as a preservative for pickles, etc. Up to the present time, little has been done to increase the consumption of any of the by-products so far mentioned. The usual method is to sell direct first and pack only the amount sold, so that there is no chance for loss. It seems to me that there is a great opportunity to increase the sale of the canned and evaporated fruit, especially in distant countries. Throughout the apple growing districts there are a great many cellars with several barrels of vinegar which never reach the market in satisfactory condition. A good many times the cider has not been properly treated. In many cases the vinegar gets dirty and is exposed to the air in such a way that acetic acid gases have escaped, leaving a poor vinegar. Vinegar, as a rule, is not a production that the market man can depend upon. I understand that there are men in the state who are taking up this vinegar proposition, and because they are making a definite strength production, clean and clear, they are making a good thing of it. We produce apples enough that are used for nothing but vinegar, so that the apple cider vinegar would drive out all the other vinegars that are put on the market, and we could have a greater consumption of cider vinegar.

There are three different methods of making vinegar. The first method I want to speak of is the household method. Now in this case the barrels are filled not over half full with sweet cider, and a small quantity of mother of vinegar is added. This should be kept in a room where the thermometer ranges from 95° F. to 100° F. At this temperature it develops better than at any other, and at the same time we are getting our desired production. It is necessary for these bacteria to have a favorable condition in order to grow. Temperature and air are necessary. This means that, if the barrel is filled full, the process will be very slow. Expose as much of the surface as you can to the air. Use large casks and don't fill them more than half full. With a proper development you ought to produce about a six per cent acetic acid in the vinegar. After two months the vinegar should be siphoned from the top. Be very careful that you get no scum on the surface. This may be put up in various retainers such as bottles, casks, or anything of that sort that will appeal to the public.

The second method is called the Orleans method. The retainers and the manufacture are practically the same as in the household method, but as soon as a portion of the finished vinegar is drawn off, more sweet cider is added to the cask, care being taken not to break the scum that covers the surface.

The third method is what we call the German method. This equipment consists of large cylinders, fifteen to twenty feet high. These are filled with clean beech shavings, because they give no odor or flavor to the vinegar. The first thing to do after these cylinders are filled with shavings is to run good cider vinegar over them, and this leaves acetic acid bacteria. Add sweet cider by means of a sprinkler, so that it trickles down through the shavings and comes out at the other end, a finished product. There should be plenty of air, and it should be kept in a warm place so that the conditions will be favorable for working to vinegar. This process is more rapid than any of the others.

I want to speak about sweet cider as a beverage. Clean, sweet cider as a beverage, before it begins to ferment, is becoming more and more popular. The one problem is to keep it sweet long enough to transport it to distant localities. The Department of Agriculture in Washington discovered that by simply running sweet cider through an ordinary cream separator that they could remove all the pomace and dirt, and it aids in the keeping quality. This product could be kept for a long while. It can be pasteurized, that is, treated exactly the same way as pasteurized milk. It is heated at 150° F. for an hour. There was a disadvantage in doing it this way for the fine flavor of the apple cider was gone, and it was not a very satisfactory product. They thought there was a greater field for sweet cider. Then the chemistry department undertook the work, hunting for some method whereby they could produce sweet cider that could be shipped all over the country, because of the fact that sweet cider in its natural condition would be fermented before it reached the consumer. Following the idea, they took sweet cider and froze it. In this way it is first frozen, then crushed, whirled rapidly in a centrifugal machine and the concentrated juice thus thrown off is collected, the water of the cider remaining in the machine in the form of ice. This is concentrated cider. It is perfectly clear after it comes from the machine and contains a high per cent of sugar. This is a very simple process and can be put in most any of our cider mills by the attaching of a freezing plant, which is not very expensive. A gallon of this represents five gallons of cider. It may be shipped long distances without paying freight charges on water.

Here certainly is an opportunity for something to be done with sweet cider. Sweet cider as a beverage certainly may be brought before the public. I have been figuring what profit may be made on this. Now I think that you will find that a gallon of this diluted will make four or five times as much, and placed at our ordinary soda stands would sell for five cents a glass, which would mean 80 cents a gallon for the cider in the diluted form, not taking out concentration. It costs you somewhere about 18 cents for your apples, as cider-mills pay 25 cents a hundred for bulk apples. Most anything that is an apple may be used for cider so long as it is kept from dirt.

There is one other subject that I want to mention; that is the production of a table syrup from apple cider. The United States Department of Agriculture has realized that the season for cider is short and, to encourage the use of more of the cull apples, they have worked out not only the method of concentrating the product, but, through the Bureau of Chemistry, they have discovered a way of making a table syrup. We have here a sample of what they have been able to produce. Their bulletin has been published, but I did not receive it in time to bring it here and tell you what is in it. As soon as this process is perfected it will be given to the public, free of charge, but probably it will be limited to some extent. Any cider-mill may add the necessary equipment and produce it. The only addition that is necessary to the present cider-mill is a filter press and evaporating kettles. The process is not complicated. Sweet cider is heated with pure milk of lime until nearly all of the natural malic acids are neutralized. This material is then heated and allowed to cool and stand a short time, which allows the lime and acids to form small crystals of calcium malate; then it is run through a filter press where they have the filters combined in such a way that they may put pressure on and force the syrup or filtrate which passes through and may be evaporated, something the way we used to make maple syrup. There is also produced from this last filtration a product called calcium malate which brings $2 per pound, and there is a good market for it. This syrup can go in competition with maple syrup. It has the odor and taste of the juice you get from baked apples. It would cost on the market today 20 or 25 cents a hundred for the apples, and you would get anywhere from $1 to $1.40 for the syrup.

In conclusion, I simply want to say that I trust that these remarks may awaken some one in the audience to put up some sort of a plant to make these by-products. We need more of these plants. If any of the gentlemen present do not care to do this, you could interest somebody else in it. I simply want to say that we feel that by putting just our best apples on the market we will get enough more for these so that we can afford to put these poorer class apples in our by-products. Every one of these by-products can be produced at a profit. I will be glad to have any and all of you people as far as you can sample this.

FACTORS IN MARKETING AND INCREASING THE SALE OF APPLES.

JOHN C. ORCUTT, Boston, Mass.

(*Stenographic Report.*)

Mr. Chairman, Ladies and Gentlemen:

I was down here a year ago, and in November we were here, so that I see a good many people that I have known, and I almost feel like saying, "How are you all?"

I am going to speak a little prepared address for about twenty minutes, and give you people a chance to ask questions in regard to the commission, storage and transportation of apples, and if I don't know the answers to your questions, I will frankly say so, or perhaps I can tell you where you can get this information, for it is only with a free and frank discussion that we can get anywhere. I come here to learn from you, as much as to tell you a few things about the market. I don't know what your problems are, but by talking them over together we can get somewhere. Now we have said that the apple industry was a science. The dictionary tells us that the science is a classified knowledge, so I have endeavored to classify some of the items in connection with the selling, marketing and increasing the consumption of apples. Now, if you please, let us have clearly in mind the six classifications:

1. What the available markets are.
2. The storage of apples.
3. The variety or classes.
4. Just who the buyers and distributors are.
5. What apples are used for.
6. Problems in selling and increasing consumption.

Last year I covered some of these points which I will hurry over, so in going ahead with our discussion we may have in mind those topics.

Markets. What are the markets? Perhaps we can divide these into groups. First, the local market. That is the market where the producer can get into direct touch with the consumer, retailers, or retail stores where they are selling these apples. The other market is what we term the outside market. This is the market in which you have to go through other agencies to reach the consumer of your product, where you ship to wholesale houses, jobbing houses and foreign markets. So then we have two markets, the local market and the outside market.

Storage of apples. Apples are stored in three ways: First, in the cellar of the grower; second, in the country warehouse; third, in the large city cold storage plants. The storage is the most important factor in the production and selling of apples for the majority, but they are sold throughout the entire 12 months. The consumption will be more in some months than in others. That varies with the different localities. You are harvesting within a short two months time during the year. Now there comes to us the question of storage. You can't lay down any definite rule as to whether it is advisable for them to store their crops in their own cellars or to ship to a large city for cold storage. What might be a good thing in this section might not be for those 25 miles away; it is the storage of apples as well as the condition of the market.

Varieties or classes of Apples. I am told by the United States Department of Agriculture that we have 2,000 different varieties of apples. Generally we have from six to ten varieties classed in three groups. When I enumerate, you must remember that this is not a hard and fast rule. I don't want anyone to say that I am in the right, for different men's opinions vary in different localities. The same buyers will have different opinions of it.

1. Eating apples.
2. Cooking apples.
3. Apples for both eating and cooking.

Of these varieties the leading eating apples are McIntosh Red, Gravenstein, Wealthy and Snow; for cooking: Baldwin, Greening and Ben Davis; for cooking and eating: Northern Spy, Wolf River and Russet. All of the other varieties will fall into one of these three groups. If you go out into the street, you will find a good many men who will put these apples in different classes, but if you will examine the trade, you will find that it follows somewhat along this line, but remember there are these three groups of apples: Eating, cooking and apples used for both.

Let us find out who are the buyers of these apples and get clearly in mind the buying of the distributing end. There are 12 sub-divisions:

1. Local buyers.
2. Wholesale houses.
3. Commission or jobbing houses.

The distinction we make between a wholesale house and a jobbing house is this: A wholesale house makes a specialty of just one thing, or perhaps one or two things, while a jobbing or commission house is one that makes a specialty of no particular thing, but handles anything that comes into the market. Just here let us see the two ways of marketing these apples. First, the sales basis, where you send the apples to the market and receive cash; second, where you sell on commission, and the man who acts as your agent sells as you direct, or uses his own judgment.

4. Retail stores.
5. Peddlers and hucksters.
6. Hotels.
7. Restaurants.
8. Boarding houses.
9. Bakeries.
10. Institutions.
11. Fruit stands.
12. Individual families.

The family trade buys in peck and half-peck lots from the retailers and peddlers, because they demand a variety and only want a few of each at a time. A large majority of the consumers of apples in the family trade have been educated not to buy a quantity of any particular kind of apple. They want Baldwins for cooking; the man of the house wants McIntosh Reds; some of the boys want Gravensteins, half a dozen at a time, while up here in the country we used to distribute two barrels at a time.

The second point, which is very important, is that the majority do not have any place to store apples, because of the fact that the cellars are too warm and the apples will not keep, and in other places, where they live in flats, there is no place to keep apples. You will see that the hotels, restaurants, boarding houses, and retail stores, generally, buy in barrel lots, while fruit-stands and individual consumers buy in box lots. There is also a great variety of difference of consumption. For instance, if I make plain the point, you will see the different kind, different quantity and different grades of apples that one can buy. Let us take a restaurant and consider the different grades it will use. They want a very fine apple to bake, a second to cut up to put into pies, and lastly they can get along with a poorer apple which can be used for apple sauce; so you see there are three grades for the restaurant.

I think the people in general do not realize the problem of distribution of these apples which the various consumers demand. You will notice that the cities will vary as to the kind and quality of apples they want. Let us see what the apples are used for. Apples have been used for four purposes: Apple pie, apple sauce, apples for eating and apples for baking.

The International Apple Shippers' Association has recently published a receipt book of 197 different ways for using apples, but the people, in general, have not been educated to the use of apples in these 197 ways.

A great many times you know people say, "There, if the prices were only lower, the consumers would rush in and eat them." If that is not so, look in your own home.

I kept track of one of the largest retail stores in the city of Boston, and made this little examination. This year eating apples were selling at 40 cents a peck; last year at the same time they were selling at 25 cents a peck, and still the sales did not increase last year because they bought in half-peck lots and this year in peck lots. I could tell you of another example of one of the largest retail stores in the east. They went down in Maine and bought apples at from 15 to 20 cents a peck. They put in a lot of apples and soon had the market drugged, because the people had not been educated to use apples in the different ways.

I want to call your attention to the Florida and California Fruit Growers. I wonder if you people are familiar with the papers. All the big daily papers in our cities, and the magazines, such as the Ladies' Home Journal and the Saturday Evening Post, carry large advertisements from these fruit growers. Do you gentlemen realize that that is one of the greatest competitors that you have? These grapefruit and orange dealers are continually giving prizes for the return of the wrappers, as in the case of the Sunkist dealers, which greatly increases the consumption of these fruits. If I eat oranges and grapefruit, I will not eat apples.

I think one of the largest and foremost distributors of apples are Steinhart and Kelley of New York, who handle for the northwestern fruit dealers their entire crop. They have a brand of apples called "Skookun" from the Indian word meaning "bully." They have a system of distribution which is very good, but is limited and needs several large associations to get together. These concerns advertise to get people to call for their goods. Why should the retailer push your apples? He wants to push something the people want to buy, and he is not going to run around and push something that doesn't pay. You should get consumers to use these apples. You have a big competition in the grapefruit and orange people. Why can't you put up just as good a showing in apples and get a system of distribution built up in the same way? We must distribute our apples. Now this will seem foolish to some people, because there are now only four well known ways to eat apples. We must get people to eat apples in the other ways. We get into the habit of having certain things and we keep in those habits and, unless new ways are continuously brought before us, we forget about them.

I have hastily run over this whole situation to try to get clearly into our minds the six very important features of the industry:

1. What these markets are.
2. Storage on these apples.
3. Classes or varieties.
4. Just who the buyers and distributors are.
5. What apples are used for.
6. Problem of distribution of apples.

You must watch the local, foreign and outside markets, because each has a certain bearing on the other. I don't know as any one could give many suggestions as to what you could do, but you must work out this question in your own localities.

If any of you people have any questions you would like to ask, I should be glad to answer them, if I can.

QUESTION: How are you going to determine whether you should use cold storage for your apples or send them to the city?

MR. ORCUTT: There are a great many things to be taken into consideration. First, how many apples have you in that immediate vicinity that the people would come to the railroad station to ship? How many thousand early and winter varieties have you? Have you enough to keep a storage house going to make it pay? Second, is there anything else you could buy to sell so as to cut down expenses? Perhaps it might not take all of the time of the man who is operating on this one business. Third, how are you marketing and what particular kind, box apples or barrel? How are you situated on the railroad?

The difference between country storage and city storage is that in the country they have no central place and they have to ship all of their apples to an outside market. We have a big market in New England. Now comes the question of whether it would pay you people to ship your apples in cold storage to Boston, Worcester, Providence and Hartford and have somebody in each of these places ready to sell the goods. You can accept an order, if you have them up here, while you are trying to write letters, telegraph, or do business. It all depends upon the location, but I tell you, you should look around and find out your own system of marketing.

QUESTON: What about hucksters and farmers going through the streets?

MR. ORCUTT: Perhaps that is one point I did not bring out. They buy all kinds of apples, both good and poor, and they go among the different kinds of people to distribute them. The retail store furnishes apples when the people want them, but the huckster tries to make them buy them when they have not thought of it.

Some people do not eat apples and you will find upon investigation that in different nationalities the food they consume is very, very different. All this has to be considered.

QUESTION: Is it any advantage for a local organization to try to cooperate in advertising?

MR. ORCUTT: Advertising is costly, for one thing. The second point is that unless you know the game of advertising, you are soon separated from your money. Let us explain that in good form. The next thing is, how many advertisements a month are going to appear in order to refresh the mind about the Maine apples you wish to advertise? You see that is going to cost so much money that they can't stand for it, but if you had several associations together to divide up the expense of advertising on all these boxes of apples, I believe it is about 600 car-loads they are handling this year, it would make a very small charge.

Now, for instance, suppose you have two men. One man is on the road trying to sell Maine apples; another man is trying to sell Scutum Brand, and he says, "Here, Mr. Retailer, we want you to handle these apples. We have them here in Portland cold storage and in Boston any time you want them. You need not take any more than you want. We will advertise for you three times every month in the columns of your local paper, and furnish cards on landing in your stores." In some associations they have wrappers, and when you send so many of these wrappers back you get a salt shaker, dishpan, orange spoon, or something like that. You see that man is going to receive the retailer's order, even if you have some better apples.

QUESTION: I understand that some of the orange growers in California ship their oranges to New York, then send a man around to the hotels and, in a way, solicit trade. Is that any advantage?

MR. ORCUTT: Yes, I think it is. Such a commission house as that handles our goods. You have to advertise your goods. We eat Kellogg's Corn Flakes and use Ivory Soap, because we see them advertised. When you apple growers get a system of that kind, you need not worry about selling your apples.

QUESTION: Can't a commission house handle that trade better than the man you hire?

MR. ORCUTT: There is just as much difference in commission houses as there is in people. If you don't look out for your own business, nobody else will—very long.

QUESTION: In regard to storage under the conditions we are working now, a great many men have to sell in the fall, and what would be the rates on local storage. Would it not be more satisfactory than the other method?

MR. ORCUTT: That comes right back to whether you can make country cold storage pay. You must have a local association. If you can get together and build it so it won't cost a lot of money, or get together and put it up yourselves very cheaply, it might. And another way is to let it out and have it cost a lot of money. I understand it is a good scheme, but I do not know much about it. In order to do this it is going to take a lot of money and must be wisely spent.

QUESTION: How much support is it going to take?

MR. ORCUTT: Apple dealers, I think, could buy and give whatever they thought they could give. Perhaps it would be $10,000. You can use a whole lot of money in advertising and not have it bring back anything. You should place your money where it will bring you returns.

QUESTION: How would this apply to the potato house?

MR. ORCUTT: I understand that down in Maine potatoes are not selling very high. I know people get accustomed to using so many potatoes and the price doesn't make so much difference as you think. Now, for instance, you take the potato situation. The consumption of potatoes is falling off by the working people from 25 to 40 per cent. Why is it? They are not very good to eat raw, and it takes wood, coal or gas to cook them, so the man cannot take a potato off very far for his dinner. People buy meat, cheese and bread, for these they can eat cold and it doesn't take money to use extra coal, wood or gas. With the condition of business everybody should count his dollars, so that is one reason they cut the potatoes down.

QUESTION: Do you think it is best to encourage the ordinary growers to sell direct to the consumer? A man, we will say, goes to a house and sells a bushel of apples without knowing how to put a production on the market. Isn't this apt to discourage the man from selling?

MR. ORCUTT: Yes, in one way, still in another it is a good way to sell them, for you are sure of getting your money. Theoretically it is not a good way. You can go in and sell them through a retail store, but the majority must go to the wholesale market. Just grade your apples into three qualities. I believe there may be a sale, even in short seasons, for a second or third grade apple. There are many consumers that use a lot of this poor grade apple, which can return you a little profit, and in this way farmers get rid of a lot of low grade apples that they could not get rid of in any other way.

QUESTION: What are the usual rates in car lots for cold storage?

MR. ORCUTT: That varies. You can write to either one of those cold storages. It might be 25 cents a month for the first month, and ten cents a month after that, but the best way is to go and see them and make your own deal.

QUESTION: What do they charge in storage plants in lots?

MR. ORCUTT: A great deal depends upon where the plant is situated. I know of two good storage plants, the Quincy Plant and the Eastern State Cold Storage Plant. The price varies. If you wait until the season is over, they are usually through by November 15, and they have to hustle around and get a place for you, they are going to charge you a larger price. You have simply to watch your chance. If you write ahead, you can get low rates, because it is cash in advance and they know what they are going to have.

QUESTION: Will you get the best results if you put apples in cold storage immediately after gathering?

MR. ORCUTT: A very successful man in New England is T. B. Windsor of Rhode Island. They tell me his apples are of very good quality. He packs them every day and rushes them into cold storage. There seems to be a great deal of difference of opinion on the packing. If you want to make a general business of apples, you should create a market for your stuff, and you should have just as near to uniformity as you can. The New York dealers won't buy Maine apples, because they have trouble with them. The customer must be satisfied and he won't use poor apples. That is why the western fellow is beating us. If you want to increase your business, you must pack with uniformity.

Now this is a nice looking box of apples. I may say something that some people won't like. We have been having fairs, but they don't sell your apples. They have big expositions in Boston all the year, but they don't go to competing with each other for a half dozen apples on a plate. They say, "Are you a manufacturer in Auburn, Maine? Let me take your name." Then they show him the best they can. They write him and say, "Don't you want to handle our stock down there?" Why can't we do the same?

If we could get enough of the large growers together so we could show these people that we want to show our apples, we could greatly increase our business. I have been to these shows time after time, seeing 15 or 20 people wandering around the hall. Why do they want to wander around and see a lot of apples, when they see a lot every day? If you could have a show of apples, then have a concert or entertainment, you wouldn't have any trouble to get the people to come. I like to go to a fair and have a good time myself, but when we think it is going to sell our apples, we make a mistake, for we must be there ourselves to look out for them, and not miles away, as in one case that I know of. We wanted to talk with the owner of some apples that were on exhibition and were informed that the man was up in New Hampshire.

You Maine people have some fine apples, and if they were down in our Boston wholesale house, they would be glad to buy them.

I thank you very much. I am very glad to have come up here and met you people again.

COOPERATIVE ORGANIZATION.

G. V. BRANCH, Bureau of Markets, U. S. Department of Agriculture, Washington, D. C.

(Stenographic Report.)

Apple Growers of Maine:

I want to say in reference to my work a few words on co-operation.

This office has not done much concrete work in the improvement of marketing farm products. Lots of the producers have been anxious to see us get in and do something. They would be better pleased if we would knock the props from under the commission men, or discover a method of marketing that has never been heard of before. Now let us explain why we cannot do it.

I just want to repeat one of the acts, which Congress lays down whenever it makes an appropriation, and the rules as to how that appropriation can be used. It says when they organize it gives $50,000 so that the Secretary of Agriculture can acquire and diffuse information on the subject of marketing and distributing of farm products. So you see our work is definitely laid out for us.

We can't bring pressure to play on a certain set of middlemen, or do anything, in fact, that won't come under the head of securing and diffusing information on the marketing of farm products. Remember in your criticisms the fact that we can't get out from under a certain field of the office.

I am going to read part of my remarks, because I find the subject of Cooperative Organization such a big one that I could talk almost indefinitely, and then after sitting down, I would find that I had not brought out the points I had intended. There are certain points that I want to bring out in regard to the situation here in Maine, so pardon me if I refer to these written pages.

It has come to a place in the fruit industry where the grower does not wax very enthusiastic over a bumper crop in the country. Bumper crops in fruit are beginning to spell trouble with a capital "T." Experience has emphasized the fact that large crops do not always bring large profits to the producers of those crops. The experienced grower knows that a large apple crop means a higher cost of labor and packages; due to a greater demand, with the proportionate drop in price for the packed fruit.

It is a fact that most growers in apple sections are in "hot water" during the spring months for they are afraid they will lose their crops and in the fall they fear having to face a bumper crop. If bugs and fungi and the methods of production keep us jumping to grow apples, how many more sleepless nights do we spend when considering the method of moving the crop at a fair profit.

A careful study of this problem of marketing leads one to the conclusion that the method used by most farmers is hardly worthy of the name, and might be more correctly called "dumping" or "getting rid of" the crop, but according to my idea, marketing is a process by which products pass from the producer to the consumer, including the operations of inspecting, transporting, buying, selling and delivering.

The average farmer has little to do with the real marketing operations, but delegates this work to numerous individuals, firms and other corporations under few, if any, restrictions, and then feels aggrieved because his share of the consumer's dollar is so small. Just as long as he leaves this work to others, he must expect them to take a liberal fee for their work.

Now let us look at some of the advantages and some of the weak points in the apple crop.

Selling in Bulk.

Early in the season speculators visit the orchards and offer a lump sum for all the fruit on the trees, and for the fruit picked and placed on packing tables. The advantage for the grower is that he is avoiding all chance of weather loss, or of market speculation, and is sure of a certain sum, as the buyer generally pays in advance. The advantage is that, while the grower is uninformed as to the crop and market conditions, the buyer has spent his time and money to secure this information, and this bid is made with a generous allowance for the speculative chance which he assumes in buying. The buyer in bulk sometimes loses, but I have known of more cases where his profits have been two or three times the profits which the grower made, and he the one who has taken many chances in growing his crops. Selling in bulk may be haphazard for the average grower, but it is a good method for the intelligent one.

Now consider selling by the barrel on the tree. This is one step further, where the buyer agrees to pay a certain price for what the orchard will pack. The trouble with the deal is that I never knew of a contract that was sufficiently definite as to what should be a proper packing grade to satisfy both parties.

If the markets for apples were high at the time of packing, the buyer would pack everything that would net him a profit; but if the market prospects were low, he would grade the apples so close that much marketable fruit would be culled out. Until a standard of apples can be determined this plan will be the cause of much controversy. Probably you don't have as much trouble with that in Maine as in some other states.

Consigning on Commission.

While there are many reliable commission firms in large cities, they are usually in the cities that have an over-supply of fruit, and this shipping to cities results in a form of concentration rather than one of distribution. However, the reliable commission firms are in touch with a large consuming trade and can move a large amount of goods, selling at a more or less fair price, but this selling on commission is hardly to be considered as marketing.

Selling to Retail Dealers.

A grower who has a nice crop of fruit can find retail dealers who can use a great deal, sometimes as much as a carload. These dealers are usually located in a section that has no good local supply and are not in touch with the cold storage supplies of any large cities. But in these deals the grower must adhere to his plan long enough to secure a reputation and then aim to cater to a special trade. In case your orchards are near a large city, it might be well to store your apples in large crates in cold storage and market them in open packages as the retail trade will take them.

Let me give you right here an example of marketing apples near Toledo, Ohio, which I consider the finest individual marketing that I know of in the country. Mr. Farnsworth has an orchard of about 125 acres, not all apples, but various fruits. He doesn't go to the large cities; he takes Toledo and Lima as his main outlets. He has the deal worked so fine that he operates almost independently of marketing conditions, and he told me that in 15 years in marketing his apples he thought he had not varied the price of the twenty-pound market basket which he used in marketing. He packs about as fine a grade of fruit as you often see. He puts red netting over them, with his printed slip, "From Toledo and Lima," and that apple is known as well as any brand of canned corn, or better; it is known all over the country. He has selected several grocery stores in various parts of the city and he gives them what they want. He has certain winter varieties and they know what these varieties are. They telephone down that they want so many baskets of this, and so many baskets of that kind. He has his own little cold storage on the farm, and furnishes them fresh every morning or so, and they sell those apples year in and year out to the retail trade at a dollar a basket. Even with his orchard as large as it is, he can't supply the markets, because he has worked up such a reputation for those apples, and the people know when they get a basket of them every apple will be perfect. A twenty-pound basket of those apples makes a fine Christmas present to a friend, or to have in the home, and you know that you have a basket of fine apples. He says, "I am almost ashamed to take the money when I see what they are selling for outside." He is in a favorite spot, but I just give that as an illustration of what he has done in selling direct to the retailer. I think this is the best example of that kind of marketing in the country.

In 1913, when scab was prevalent in the country, he found in his whole orchard only two apples which had the least scab upon them. He sprays so thoroughly and constantly and has gotten those diseases so well under his control that during one season he found only three scabby apples in his whole orchard.

Selling Direct to the Consumer.

This plan requires fancy fruit, careful grading and inspection, a large amount of expensive advertising, correspondence, bookkeeping, etc. A few have made this system pay, but it is not easily adapted to the average grower. It takes time to build up the personal reputation. However, it is an ideal way if once developed.

Selling Through a Cooperative Association.

In all these plans we have the work of the individual—the man who has been so busy in producing the crop that he has not had time, nor was the value of his crop sufficient to warrant the expense necessary to keep him accurately posted as to what his crop is really worth in the market. His dealings are not large enough to give him a wide reputation and he is practically the prey of speculators. Right here is where a well managed organization can solve most of the problems. Only organized producers can expect to cope with organized speculators. In no other way can we ever get a high standard of excellence. The most desired of all business accomplishments is a good name. In no other way can we develop a plan of distribution that will discover the fact that not all consumers live in large cities, and that fruit must be delivered to those who want it, but have been forced to substitute because they were cheated. The United Fruit Company brings their insipid and perishable bananas thousands of miles, and then outsell our own fruits in our own markets. Could that ever have been done by the individual banana growers? You know better, and yet with all these examples, you tell me it can't be done in Maine.

Somebody said it couldn't be done,
    But he with a chuckle replied
That "Maybe it couldn't," but he would be one
    Who wouldn't say so till he tried.
So he buckled right in, with the trace of a grin
    On his face. If he worried, he hid it.
He started to sing as he tackled the thing
    That couldn't be done,
        And he did it.

Somebody scoffed: "Oh, you'll never do that;
At least, no one has ever done it."
But he took off his coat and he took off his hat,
And the first thing he knew he'd begun it;
With a lift of his chin and a bit of a grin,
Without any doubting or quidding,
He started to sing as he tackled the thing
That couldn't be done,
And he did it.

There are thousands to tell you it cannot be done,
There are thousands to prophesy failure;
There are thousands to point out to you one by one,
The dangers that wait to assail you;
But just buckle in with a bit of a grin,
Then take off your hat and go to it;
Just start in and sing as you tackle the thing
That "cannot be done"
And you'll do it.

My experience has been largely in trying to sell in the market in which the average individual grower sells. Trouble in grading can be traced to growers. Looking at it from the marketing end, let us go over some of these problems. First, we have unmeasured grief as the result of lack of strict grades. Hardly two people can be found who will agree on what a No. 1 apple should be, under conditions existing in most states. In a year of light production it is anything that can be covered up inside of the barrel. In years like this it must look like a twenty-dollar gold piece. Can such a state of affairs result in anything but misunderstanding, dishonesty and dissatisfaction? Why the very foundation requirement of successful trade is a basis of mutual understanding and confidence.

When buyer and seller are far apart, stringent rules for grading are vital. You are lucky up here in Maine to have a pretty good grading law, but you cannot reap much of the benefit of such a law without a good organization to advertise and boost the sale of apples packed under that law.

When the individual puts his fruit up right he is often as helpless as before, for perhaps the local buyer fails to give him a price that will pay him for the extra amount of trouble, or he dumps this good fruit on an overloaded market through ignorance of market conditions. Perhaps his apples are not as good as they should be; or often it is because he cannot get a sufficient amount of good trade apples, and in other cases it is because he has not a good man who knows how to sell at a good price. When we trust the business to others whose interests are not identical to ours, we cannot expect to get the highest returns of the markets. They must take great responsibility in the marketing of our produce before ever gaining control of the marketing channels. But can this be done, individually? The men are not trained in business methods, and you face an army of keen business men who are trying to keep you from marketing your produce. You have called them into business and have given them their chance, but you sit here at this end getting your quotations from a farm paper and trying to cope with the difficulties single handed. That is one thing that cannot be done. Get your growers together, hire some one to sell your produce, who is under your control, who is trained in marketing and knows the market value of your goods; one who knows how to sell and to prevent your goods from being concentrated in the large cities. These are just a few things it is possible to expect. Add to these a good orchard supply and you have a good cooperative business, a service agency which can be made as great as you please, according to the local support which you give it. There are these things that a producing section must have, if marketing is to be improved. Let us repeat those discussed and add a few more.

Grades and standards are essential. A reputation must be established for good products, and made known to the public through advertised brands. A dependable supply of these products is necessary. Market news, accurate and up-to-the-minute, must be secured. A salesman and business manager, who knows the marketing game as well as the men who buy the crop, is a requirement that is an absolute necessity. Local antagonism and cut-throat competition must be done away with. How can you secure these except through cooperation. Do not tell me that you have tried cooperation and have failed. Ninety-nine times out of a hundred you do not know the first principle of cooperation. Do not believe for a minute that you could cooperate broadcast all over the country. Certain conditions must receive attention if it is to be successful. There must be a need of cooperation, and a bad one. There must be a cheerful cooperation on the part of the producers. There must be a sufficient production available to warrant an establishment of an organization in this section. Cooperation is not a cure-all to be attempted on every kind of ground. You don't expect an apple tree to grow in a low sandy valley, but you must have the right conditions to develop efficiency for producing good fruit. You should also have the right conditions to set our your cooperative plans. I have not the time to get acquainted with your circumstances here, but maybe you are not ready for it yet. This can be told only by close observation in this section.

Let us look for a moment to other conditions. We find the outlook rather dark just now. A crisis calls for judgment and coolness. Move your stock out gradually and move only your good stock, for in a year like this it is almost a crime to flood your market with poor goods. Keep in the closest possible touch with market conditions through dependable agents in the distributive centers and through good trade papers. Develop your home markets and give them good fruit.

Here are some suggestions, issued last fall by the Office of Markets which I represent. It would be well to remember them, especially in seasons like this. It is strongly urged:

First. That growers pick and handle the fruit in such condition as to insure it against deterioration.

Second. That growers, associations and operators who use the barrel as a container adopt the standard barrel and uniform grade, and pack the crop in compliance with the standards of the law, branding their packages accordingly.

Third. That all inferior grades be eliminated from the green-fruit markets, and diverted as far as possible to cider-mills, canneries and evaporators.

Fourth. That only long-keeping, standard packed varieties be placed in cold storage.

Fifth. That a special effort be made to fully supply small towns by direct sales for the purpose of securing equitable distribution and avoiding the congestion of large markets.

Sixth. That all growers, operators, dealers and associations early reconcile themselves to the conditions and arrive at an early estimate of true values, in order to assure quick movement of the crop from producer to consumer. In explanation, that growers should not attempt to harvest the crop at one picking, but rather pick the fruit as it is ready to come off, and in uniform condition, repeating this until the entire crop is harvested. The advantage is that the shipping may begin earlier and last a longer period. Furthermore, if all the fruit is harvested at the same time, that shipment will represent the extreme stages, ranging from ripe to green, all in the same package.

You must be careful of the way in which you handle your fruit. It will mean a great deal to you if you will remember that. Business works out the law of averages you will find in every particular. In the bad years, farmers are very apt to throw up their hands and howl, but every business must figure the poor years in with the good. If you can't figure in both years and make an average crop that pays, you should get out of the business, for it is very evident that you cannot win out in the long run. The average community, unless particularly well favored, will do well to even make itself self-sustaining.

MARKETING FANCY APPLES IN MAINE.

E. E. CONANT, Buckfield.

(*Stenographic Report.*)

Mr. President, Ladies and Gentlemen:

I was asked to give my experience along the line of marketing fancy apples in Maine. Now, this is something we have never done much of, but have attempted it with very little success. It may be because we are not educated to know what fancy apples are and how to box them in the right shape to put into market.

I struck out this year to see what I could do in a few small lines. The business men were trying to boom Maine, but one of the best ways had been overlooked, that of selling apples on the train. So in August I made it my way to go down to Portland and visit Chisholm Brothers to see if we could not furnish the Maine Central with our apples. I went to Mr. Leighton, and I am going to say right here that he is one of the finest men I ever met, and I told him what I wanted to do.

"Now," he said, "we have tried Maine apples a number of times, but we never could get them good enough. They don't know what a good apple is."

I talked with him a long time and I tried to convince him that we fellows had tried to learn what a good apple was and I thought we had some idea.

Finally he said, "Well, I am going to try your apples on the train this year and see what the quality is."

And I said, "Thank you, we'll see that the quality is all right."

To show you that I am telling you things just as they are, I am going to read you the reply to my first shipment of apples.

"Your shipment of apples received some time ago. For more than 40 years one of the most serious difficulties has been to secure a suitable apple for trains, having been compelled to use western grown fruit. It now affords me pleasure to learn that you will be able to furnish the future supply of our requirements.

"In all these years we have never seen apples equal to this shipment, either in color, size or uniformity, while in flavor they are much ahead of western fruit. Maine is surely coming to the front in the production of apples."

Now, that was unasked for. Every box of apples that has been used on the train since then has been our Maine fruit, in fact, has been grown by the Oxford Bears. What we have done, anyone could do that puts their fruit up in this way, but I want to say right here that there are very few who know what box apples are. The time is coming when we must organize in some way so that we can get together and keep these western box apples from the state.

I want to give you a little idea of the number of boxes we might have sold and the amount of money that we lost last year. Last year was especially good, and there were more box apples from the west than ever before. They claim there were 16,250 boxes sold in the State of Maine at the rate of $2.25 a box. What does this mean? That $36,562.50 went west for fancy apples, and here we are in the apple business in the State of Maine. Do you have any idea that the western men would allow us to ship our apples there? Not on your life! Stop it or not, it is just up to us whether we keep that money in the State of Maine. We ought to have kept that $36,562.50 in our own state last year.

The only way we can do this is to organize and put up our apples and have them handled by one man, and in that way I can see no reason why we cannot increase our sales, not only in the west, but also in the New England states. But you see it is just up to us.

There is a lot more I would like to say, but I will leave the matter for your discussion. I am ready to answer any questions you want to ask.

QUESTION: What variety did you furnish the Maine Central?

MR. CONANT: McIntosh, Snow, Nodhead, Baldwin, and Spy, besides a number of early kinds. This year we did not have the good box packs, and for that reason I was not able to put up all the apples I wanted to.

Now, here is a sample. I went down to the market this morning and bought two of their fancy apples sent here from Washington. I think they are Western Gano. Just look at them. I don't want anybody here to put up such apples in boxes and mark them "State of Maine Apples." I do not understand their being so poor, for they say western apples are uniform. Here are two more they had at the banquet last night, but these are uniform in size and a very nice pack. Notice the pack. Here are the State of Maine apples, elegant fruit; compare them with the apples I just showed you. They beat the other all out. That is nice looking fruit, and you put that in storage and you can have it nearly all winter. Why can't all of our apples be put up in this shape?

QUESTION: Did Chisholm Brothers make any special contract to take a certain grade?

MR. CONANT: No, I made no contract with them. They agreed to use all that were satisfactory.

QUESTION: Did you pack more than one grade?

MR. CONANT: No, all the same grade and size.

QUESTION: How did you pack in boxes?

MR. CONANT: We used layers of paper and pulp heads. Now, whoever undertakes to pack fancy box apples, be sure to do it up good. If you want to do business, you want to start in right, and you must have good fruit. That is the only way. It has been tried a number of times but the apples were not quite up, but whenever we start in business, we must do it good and strong. Our apples that we furnished them are all nicely wrapped and our association name is on each wrapper.

QUESTION: What do you do with the apples that you cast out?

MR. CONANT: Now, of course, there are a good many No. 1's left even after we have taken our fancies out and there is always a market for them. The poorer grades can be used for cider.

QUESTION: What proportion of the apples sent to the market are eaten raw?

MR. CONANT: The bulk of the people cannot afford apples at 50 cents a peck, and the majority of my customers say, "We cannot afford to pay it." The price must be down so that they can have what they want.

MR. BATEMAN: I agree with the remarks just made, that we must come down to the consumer, but we have just heard it said that there is a vast difference in the fruit, but there is also a vast difference in the consumer. There are plenty of men willing to pay a good price for apples but they cannot get them. You people bring us simply the culls.

Who bought these 16,000 barrels? Now, that price was only the wholesale price and retailers paid better than $4.00 a box. It will be a question before we can raise enough to supply even that market, "Are not our apples as good as the western apples?" We must raise better apples.

Another thing, we can't come in here and hunt around. If we knew who the people were who were willing to pay the price! But we can ship in car-load lots and get a good price. If we can only praise the goods there are lots of people who will pay the price for the best quality.

QUESTION: I would like to ask if you shipped some apples to the manufacturers of the Stanley Steamer.

MR. CONANT: I shall have to explain that a little. Prof. Sargent telephoned me saying that he wanted me to send him a box of McIntosh Reds. I put up a nice box of apples for him. Mr. Stanley is a western apple buyer, and he always thought there was nothing like the western apples, and that we did not know how to raise apples in the State of Maine. And he went on to tell me his idea of the Maine apples, but when he saw this box of McIntosh Reds, he said, "I have got to change my mind a little, but send me another box of these apples." He thought those were wonderful.

So, at Christmas, we sent him another box, this time Northern Spies, and later we sent a bill. It seemed as if it had not had time to reach there before we received a check and this letter which I will read to you:

"The apples came and were the finest Northern Spies bought. They have the best appearance and flavor of any I ever saw, and if the orchards of Maine can produce apples as fine as these, western apples are out of it. Later I will order a box of Baldwins and see what you can do in this line."

Since then I have shipped him many boxes of apples and get the same reply every time. I could have come right into these markets here last fall, bought apples and shipped them to Boston, and made good money. I don't understand why it is that we can't get our price for good apples here.

MR. BATEMAN: I am willing to pay any reasonable price for good apples, but I could not find good apples in the market here. I have told the men to bring me good fruit and send me a bill, for I am willing to pay a good price. But I cannot get them here, and I know of hundreds of men who would be willing to pay a good price, if they could get them. But it isn't very pleasant for such people to be told that they are not willing to pay the price, for we are willing, but we simply cannot get the good apples and that is all there is to it.

One evening this fall I received a call from an apple dealer, saying that he had an order for a barrel of nice apples. He said he wanted Northern Spies and asked if I could supply these apples, and said for me to set my own price. I said, "Will $5 be too much?" and he said that he did not care what was the price, but he wanted good apples. I sent them and got my price.

MR. BATEMAN: And I have been paying $6 for the same kind of apples that you preferred to sell to the other man.

Now there are some men who would have put into that barrel something that ought not to be there, but you can not do business in this way. Give them an honest pack and you will get another order. Whether your apples are in barrel or in box, you must bear that in mind.

QUESTION: Do you thin your apples in order to get the quality?

MR. CONANT: There are some kinds that should be thinned in order to get the quality. We have not done much of that but we shall have to do a good deal more in years to come.

Maine produces good apples and enough of them, but we have got to put out a good brand so that the people, when they buy that fruit, will know that they are getting just what they are paying for, and they will know to what association they can send to get another box like them. But there are many people that are a little dishonest and cannot be depended upon.

QUESTION: Can you tell us how they sell apples in Liverpool?

MR. CONANT: I will hit upon some of the points, but I do not want to take up too much time.

Of course, at first, these apples are all landed from the steamer upon the dock and sent to the basement of the auction rooms. There they are all examined by auctioneer buyers, who come down there and open every man's apples that they want to, and examine them as deeply as they like, and each man's lot is catalogued in a book, stating how many he has and in what condition they are found.

The auction room will hold four hundred men and these buyers are licensed buyers. Perhaps you might think that this is wrong, but I will show you that it is all right and proper. Suppose that any man could go in there and buy from 100 to 1,000 barrels. The auctioneer doesn't know whether or not he is able to pay for one barrel or one hundred. But they do not do this way for they have to know the standing of every buyer, and the next day he has to pay for all that he sells. So you see it is all fair and proper that each man be a licensed buyer.

These apples, after being examined, are taken up from the basement on an elevator, and the minute they come through the floor they are auctioned off. They have six bookkeepers to keep account of the sales. Everything is done quickly. A man has to be used to it because the auctioneer talks so fast.

These apples come up with head out—in two oblong baskets large enough to show the greater part of the apples. As soon as they are sold, they are sent back down, and more will come up on another elevator at the same time. They are all sold in twenty-barrel lots, and a man must bid on 20 barrels, but he can take one, two or three lots. If a man says he will take three lots, and another bids on four, at the same price, the bid goes to the man bidding for the greater amount.

And that is generally the way all apples are sold.

MAINE FRUIT GROWERS' EXCHANGE.

After a conference with several of the representatives of the different fruit growers' organizations in the state, it was deemed advisable to call a meeting to find out if the time was not ripe for an amalgamation of the fruit growers into a central exchange. This meeting was held at the Elm House, Auburn, on June 25. Seven of the ten fruit growers' organizations of the state were represented, and after the Bureau had outlined a plan of organization, based upon similar lines to those already in successful operation, the delegates voted to form the Maine Fruit Growers' Exchange. The purposes of this organization, in a broad way, are to buy, sell, contract for, deal in, produce, handle and manage all kinds of fruit, vegetables and agricultural products; to buy and sell, contract for, to lease and manage real property; to borrow and loan money; to execute promissory notes, bills of sale, deeds and leases, mortgages and all other instruments in writing, necessary to the transaction of the business of said corporation; to buy and sell merchandise; to cure, pack, dry, can and preserve all kinds of fruit and vegetables; to buy, lease and operate boats, cars and other means of transportation; to do any and all acts and things necessary to carry out the above named business and promote the welfare of the members of said corporation.

The organization was perfected and organized under the state law. Officers were elected as follows:

President, W. H. Conant,	Buckfield
Vice-President, J. H. King,	Mechanic Falls
Clerk, W. G. Roberts,	Waterboro
Treasurer, Prof. A. C. Russell,	Kent's Hill

Directors: W. H. Conant, W. G. Roberts, J. H. King, Prof. A. C. Russell, A. N. Deering, Denmark

The local associations represented in the Exchange are as follows:

Oxford Bears Fruit Growers' Association	Hebron
Kennebec Hillside Fruit Growers' Association,	Kent's Hill
Pine Tree State Fruit Growers' Association,	Mechanic Falls
Ossipee Valley Fruit Growers' Association,	Waterboro
Moose Lake Fruit Growers' Association,	Denmark
Auburn Fruit Growers' Association,	Auburn
Red Fox Fruit Growers' Association,	Acton

At a later meeting of the Board of Directors, E. E. Conant of Buckfield was chosen as manager of the Exchange.

Owing to the scarcity of good fruit this year, the Exchange has not been able to do many of the things hoped for, but considerable progress has been made, and with a good crop next year, there is no reason to doubt but that the organization will be launched upon a successful career.

Individual growers, who ship in car lots and who are located in sections where there is no organization, can obtain membership in the Exchange and ship their fruit under the same conditions as local associations. A few of the growers, so situated, took advantage of the opportunity this year and are holders of stock in the Exchange.

A large saving was made in the purchase of packing supplies this fall and plans are under way for the purchase of sufficient materials for the use of the growers for the coming season. In the purchasing end alone, the Exchange will be able to save the growers a large amount of money, probably more than enough to offset the expenses connected with the operation of the Exchange.

APPLE SHIPMENTS.

In the 1914 Report this Bureau estimated that the crop would be approximately 600,000 barrels. This of course refers to the commercial crop handled by the various transportation companies. The actual transportation was 598,487 barrels, showing that the Bureau was less than 2,000 barrels, or one-fourth of one per cent out of the way. The Government Report for the same season was approximately 7,000,000 bushels. There is no reason to doubt these figures, as they are based on the total production. Upon these figures as a basis, we find that the difference between the commercial and the actual production is in the vicinity of 5,000,000 bushels, or approximately a waste crop of 70 per cent of the total fruit produced. The reason for this enormous waste is based upon several factors. These factors include inferior fruit, varieties having little commercial value, and low prices. It is generally conceded that the crop this year was about 20 per cent of last year's crop; so that we would expect a commercial crop of about 125,000 barrels. Notwithstanding the fact that fruit this year was much inferior in quality, there was probably a larger proportion of the total crop shipped so that reasonable estimate would be in the vicinity of 150,000 barrels.

An effort is being made to have the Government give a commercial estimate, as well as an agricultural estimate, so called. This would be of great benefit to the grower in that he would have a clear understanding of the competition to expect from other sections. At the present time the estimate is a hindrance rather than a help, showing as it does an enormous supply and one greatly in excess of the actual commercial consumption. Such an estimate tends to depress the market at picking time, and to injure the confidence of the grower and speculator alike. This probably was one big reason for the lack of activity on the part of the apple buyers a year ago. Another feature of the Government estimate which is more or less misleading is the term normal, as applied to the apple crop. I have yet to find out the exact meaning of such a term, even after continued discussion with the Government experts on the subject. It would seem that last year's crop furnishes the most desirable basis for an apple estimate. It may be possible, however, to adopt a variable standard of production per acre, which will clear up the meaning of the term normal.

In the tables shown below is given the number of barrels of apples shipped over the various transportation lines from Sept. 1, 1914 to August 1, 1915, and the number of barrels shipped from the larger producing centers of the state. In Table 1 it was necessary to take out the barrels transferred from one road to another so that the actual total, as given, does not represent the compilation of shipments over each road or line. As before noted, the actual total is 598,487 barrels. In Table 2, we find that West Paris led the other stations by a considerable margin in the number of barrels of apples shipped, and it is especially noticeable that six of the first seven leading stations are located in Oxford county and represent approximately 150,000 barrels or 25 per cent of the entire crop. This proportion is considerably increased with the addition of many smaller shipping stations in the county. Somerset, Kennebec and Androscoggin are the only counties other than Oxford represented in the first 12 shipping stations.

I.

BARRELS OF APPLES SHIPPED FROM SEPT. 1, 1914, TO AUG. 1, 1915.

	Barrels.	Boxes.
Maine Central R. R.	446,675	
Grand Trunk Ry.	105,488	
Eastern Steamship Co.	24,071	3,802
Boston & Maine R. R.	17,654	
*Bridgton & Saco River R. R.	17,256	
†Bangor & Aroostook R. R. Co.	16,104	
*Wiscasset, Waterville & Farmington R. R.	11,400	
*Georges Valley R. R.	9,529	
*Bangor Ry. & Electric Co.	8,624	
*Sandy River & Rangeley Lakes R. R.	5,250	
Actual Total	598,487	

*Transferred to another road.
†Transferred to another road, 11,505.

II.

BARRELS OF APPLES SHIPPED FROM TWELVE LARGEST SHIPPING POINTS FROM SEPT. 1, 1914, TO AUG. 1, 1915.

West Paris	35,462
Monmouth	26,249
South Paris	25,300
East Hebron	24,636
Buckfield	22,976
Norway	21,362
West Minot	19,681
Winthrop	17,809
Greene	14,586
Auburn	13,898
Skowhegan	10,752
Hartford	10,500

INSPECTION OF INCOMING NURSERY STOCK.

Inasmuch as it was out of the question to inspect all of the incoming nursery stock upon arrival, because of a lack of sufficient inspecting force, it became necessary to devise some effective way in which to check up on the condition of this stock. A report sheet was made up covering condition of the stock, kind and amount of plants, nursery firm making the shipment, agent, if any, making the sale and value received. With these sheets in operation it became necessary to inspect only such stock as did not give satisfaction, except in instances where it was convenient to inspect upon arrival. This method seems to be satisfactory, under the circumstances, and with the cooperation of the growers in reporting, should result in material benefit to the state as a whole. Stock this year was particularly good, and out of 1,669 shipments received only 29 were unsatisfactory. It is very noticeable that only 278 of these shipments were sold directly through agents. From the report sheets we are able to present the following Table which shows the number of various fruit trees and vines received. In some cases it was necessary to give approximate figures, but in general the Table is a good index of the amount of stock.

No. of Apple Trees	121,000
Plum Trees	5,250
Pear Trees	4,150
Cherry Trees	3,100
Peach Trees	1,700
Raspberry Plants	33,500
Blackberry Plants	8,400
Strawberry Plants	78,200
Currant Bushes	3,000
Gooseberry Bushes	2,100

List of Nursery Companies that have delivered orders in the State of Maine during the year 1915 is as follows:

	Name.	Address.	No. of shipments Spring.	Fall.
1	Adams Co., J. W	Springfield, Mass	1	-
2	Allen Nursery Co	Rochester, N. Y	13	-
3	Allen, W. F	Salisbury, Md	2	-
4	American Forestry Co	Boston, Mass	1	-
5	Anderson, W. L	Lakeville, Mass	2	-
6	Bacon, W. & A	Boston, Mass	4	-
7	Baldwin, O. A. D	Bridgeman, Minn	1	-
8	Bauker, Daniel G	Dansville, N. Y	3	-
9	Barnes Bros	Yalesville, Conn	9	-
10	Bay State Nursery	No. Abington, Mass	9	-
11	Blitmore Nurseries	Blitmore, N. C	1	-

	Name.	Address.	No. of shipments Spring.	Fall.
12	Bobbink & Atkins	Rutherford, N. J	3	-
13	Bradley Brothers	Makanda, Ill	1	-
14	Breck, Joseph & Son	Boston, Mass	2	-
15	Breck-Robinson Co	Lexington, Mass	13	-
16	Brown Brothers Co	Rochester, N. Y	6	-
17	Brown Nursery Co., F. W	Rose Hill, N. Y	4	-
18	Bryant & Ordway Co	Boston, Mass	2	-
19	Burr, C. R. & Co	Manchester, Conn	6	-
20	Canning, Edward J	Northampton, Mass	1	-
21	Central New York Nurseries	Geneva, N. Y	2	-
22	Chase Bros	Rochester, N. Y	78	-
23	Chase, C. H	Rochester, N. Y	2	-
24	Chase, R. G	Geneva, N. Y	2	-
25	Chase Co., G. H	Geneva N. Y	2	-
26	Chase, Homer N	Geneva, N. Y	32	1
27	Charleton Nursery Co	Rochester, N. Y	3	-
28	Charleton & Sons, John	Rochester, N. Y	1	-
29	Childs, John Lewis	Floral Park, N. Y	3	-
30	Cobb & Co., W. F	Geneva, N. Y	71	-
31	Conrad & Jones Co	West Grove, Pa	5	1
32	Coony Eckstein Co	New York, N. Y	1	-
33	Costich Co., G. A	Rochester, N. Y	1	-
34	Conrad, O. D	West Grove, Pa	2	-
35	Cutler, G. A	Florence, Mass	1	-
36	Dansville Nurseries	Mt. Morris, N. Y	1	-
37	Denton, Williams & Denton	Dansville, N. Y	1	-
38	Dingee & Conrad Co	West Grove, Pa	6	1
39	Dreer, H. A	Philadelphia, Pa	16	1
40	Eager, W. W	Waverly, Mass	2	-
41	Eastern Nurseries Co	Holliston, Mass	2	1
42	Eliot Nurseries	Pittsburg, Pa	6	1
43	Ellwanger & Barry	Rochester, N. Y	8	-
44	Elm City Nursery Co	New Haven, Conn	1	-
45	Fairview Nurseries	Rochester, N. Y	3	1
46	Farmer, L. J	Pulaski, N. Y	6	-
47	Farquhar, R. & J	Boston, Mass	35	5
48	Farr, Bertrand H	Wyomissing, Pa	1	-
49	Fernald, W. G	Eliot, Maine	1	-
50	Ferris, Earle	Hampton, Iowa	2	-
51	Finger, W	Hicksville, N. Y	1	-
52	Finn, John W	Dansville, N. Y	6	-
53	First National Nurseries	Rochester, N. Y	5	1
54	Fish & Co., C. R	Worcester, Mass	4	2
55	Franklin Nursery	Franklin, Mass	2	-
56	Fottler, Fiske & Rawson Co	Boston, Mass	7	-
57	Framingham Nurseries	So. Framingham, Mass	6	-
58	Frank, Richard	Long Island	1	-
59	Frazier, Sam	Genessee, N. Y	1	-
60	Fruit Grower & Farmer	Neosha, Mo	2	-
61	Ford Seed Co	Ravenna, Ohio	1	-
62	Galloway Bros	Waterloo, Iowa	1	-
63	Gardner Nursery Co	Osage, Iowa	11	1
64	Gates, W. A	Needham Hts., Mass	2	-
65	Gillett, Edward	Southwick, Mass	1	-
66	Gimbel Bros	Philadelphia, Pa	1	-
67	Glenn Bros	Rochester, N. Y	8	1
68	Graham Nursery Co	Geneva, N. Y	7	-
69	Granite State Nursery	Durham, N. H	1	-
70	Great Western Plant Co		1	-
71	Green's Nursery Co	Rochester, N. Y	180	3
72	Gregory, J. J. H	Marblehead, Mass	1	-
73	Gray Co., Thos. J	Boston, Mass	1	-
74	Grover & Co., F. E	Rochester, N. Y	4	-
75	Gurney Co., F. A	Schoharie, N. Y	2	-
76	Gurney & Co., H. H	Geneva, N. Y	15	1
77	Hall, L. W. & Co	Rochester, N. Y	7	-
78	Hamburg Nursery Co	Weaverville, N. C	1	-
79	Hanson, H. N	Rose Hill, N. Y	1	-
80	Harmon Co., M. H	Geneva, N. Y	7	-
81	Harrison & Son, J. G	Berlin, Md	7	-
82	Hawkes Brothers	West Chester, Pa	2	-

	Name.	Address.	No. of shipments Spring.	Fall.
83	Hawkes Nursery Co	Rochester, N. Y	1	-
84	Heller Bros	Newcastle, Ind	1	-
85	Henderson Co., Peter	Jersey City, N. J	8	-
86	Herrick Seed Co	Rochester, N. Y	25	-
87	Hitchcock, E. M	Agawam, Mass	1	-
88	Home Planters Ass'n	Rochester, N. Y	1	-
89	Hooker, Wyman Co	Rochester, N. Y	7	-
90	Hosford, F. H	Charlotte, Vt	6	-
91	Houghton & Dutton	Boston, Mass	1	-
92	Howard, J. W		1	-
93	Huson, Calvin J	Albany, N. Y	1	-
94	Hussey, J. C	Oakland, Maine	3	-
95	Jackson & Perkins	Newark, N. J	3	-
96	Joliet Nurseries	Joliet, Ill	1	-
97	Junction Fruit Farm	Ellsworth, Maine	2	-
98	Keene Forestry Ass'n	Keene, N. H	1	-
99	Kelsey, Harlan P	Salem, Mass	1	-
100	Kelsey Nursery Co	St. Joseph, Mo	1	-
101	Kelley Bros	Dansville, N. Y	40	-
102	Kellogg Co., R. M	Three Rivers, Can	6	-
103	King, B	Tewksbury, Mass	8	-
104	King Bros	Dansville, N. Y	4	-
105	Kingsley, H. P	Boxford, Mass	1	-
106	Knight & Son, David	Sawyer, Mich	3	-
107	Knight & Bostwick	Newark, N. J	4	
108	Little Tree Farms	Framingham, Mass	7	
109	Lovett, J. F	Little Silver, N. J	3	-
110	Maloney Bros. & Wells Co	Dansville, N. Y	62	1
111	Manning Nurseries	No. Wilmington, Mass.	3	-
112	Maule, Wm. Henry	West Grove, Pa	5	-
113	McCabe Co., E. L	Rochester, N. Y	3	-
114	McCarthy & Co., N. F	Boston, Mass	3	-
115	McGregor Bros. Co	Springfield, Ohio	1	-
116	Mills Seed Co	Rose Hill, N. Y	5	-
117	Mitchell Seed Store		-	1
118	Mitchell & Co	Waterville, Me	9	-
119	Moore & Co., W. C	Newark, N. J	1	-
120	Moon, William H	Moonsville, Pa	1	-
121	Moose Heart Nursery	Moose Heart, Ill	2	-
122	Moulton, Gilman H	Northampton, Mass	1	-
123	Mt. Desert Nurseries	Bar Harbor, Maine	5	-
124	Mt. Hope Nursery	Lawrence, Kans	1	-
125	Nash, A. D	Damariscotta, Maine	3	-
126	New England Nurseries	Bedford, Mass	29	4
127	N. H. State Nurseries	Durham, N. H	1	-
128	Northeastern Forestry Co	Cheshire, Conn	1	-
129	Perry, Basil	Georgetown, Del	2	-
130	Peterson, Geo. H	Fair Lawn, N. J	3	-
131	Perry Nursery Co	Rochester, N. Y	3	-
132	Pierson, A. N	Cromwell, Conn	4	-
133	Pomona Ten Cent Nurseries	Dansville, N. Y	10	-
134	Porteous, Mitchell & Braun	Portland, Maine	1	-
135	Pratt, Chas. S	Reading, Mass	4	-
136	Randall, Alton E	Dansville, N. Y	4	-
137	Reilly Bros	Dansville, N. Y	20	-
138	Reilly, Wm. J	Dansville, N. Y	4	-
139	Rice Brothers	Geneva, N. Y	12	-
140	Rice, T. W	Geneva, N. Y	3	-
141	Richland Nurseries	Rochester, N. Y	7	-
142	Roesch, Lewis	Fredonia, N. Y	2	-
143	Rupert & Son, W. P	Seneca, N. Y	21	-
144	Saltzer Seed Co., John A	LaCrosse, Wis	1	-
145	Schmidt & Botley Co	Springfield, Ohio	3	-
146	Scorff, W. M	New Carlisle, Ohio	1	-
147	Sheerin's Nurseries	Dansville, N. Y	15	-
148	Sherwood, Elmer	Odessa, N. Y	12	-
149	Smith, W. & T	Geneva, N. Y	8	-
150	Snow, T. H	Dansville, N. Y	1	-
151	Squires, Henry L	Remensburg, N. Y	1	-
152	Squires, H. L	Good Ground, N. Y	2	-
153	Stark Bros. Nursery Co	Louisiana, Mo	30	1

	Name.	Address.	No. of shipments	
			Spring.	Fall.
154	Stark Nurseries, Wm. P.	Stark City, Mo.	14	-
155	Stuart & Co., C. W.	Newark, N. Y.	16	1
156	Storrs & Harrison Co.	Painesville, Ohio.	5	-
157	Sweet, George A.	Dansville, N. Y.	3	-
158	Tobey, N. P.	Durham, N. H.	1	-
159	Three Rivers Nursery	Three Rivers, Mich.	1	-
160	Thurlow Sons, T. C.	West Newbury, Mass.	3	-
161	Thurston, F. C.		-	1
162	Tricker, Wm. T.	Arlington, N. J.	1	-
163	Tucker, G. W.	Waterboro, Conn.	1	-
164	Van Dusen Nurseries	Geneva, N. Y.	9	1
165	Vaughn's Green House	W. Springfield, Ill.	1	-
166	Vaughn Seed Store	New York, N. Y.	2	-
167	Vick's Sons, James	Rochester, N. Y.	6	-
168	Walsh, M. H.	Woods Hole, Mass.	3	-
169	Wanamaker, John	Philadelphia, Pa.	12	-
170	Wells Nurseries, F. W.	Dansville, N. Y.	11	1
171	West Side Nursery Co.	Worcester, Mass.	6	1
172	Wheeler Wilfred	Concord, Mass.	1	-
173	Whiting Nurseries	Geneva, N. Y.	4	-
174	Whitman Bros.	Lowell, Mass.	2	-
175	Wiley & Sons, H. S.	Cayuga, N. Y.	9	-
176	Wood, Allan L.	Rochester, N. Y.	17	-
177	Woodlawn Nurseries	Rochester, N. Y.	2	-
178	Wyman Nurseries	Rochester, N. Y.	13	-
179	Xenia Star Nurseries		1	-
	Total		1273	33

LICENSED NURSERY AGENTS.

During the past season 72 nursery agents have been licensed to sell stock in the State of Maine. The Department has come across evidence that certain other parties have been engaged in the nursery business and steps are under way to bring these men to account. With the addition of these men, however, the total will be less than 100, which shows a decrease of over 50 per cent from last year. This decrease is due in part to the license fee, but more largely to the very attractive prices offered in the catalogues of nursery firms dealing directly with the grower. The business of selling trees by making a house to house canvas is becoming more difficult each year as most nursery firms pay the agent at least 25 per cent of the listed price, consequently cannot meet the attractive prices offered by firms selling without agents. As the stock and guaranty does not differ materially, it is difficult to explain to the grower why he should pay this commission.

The following table gives the licenses expiring in 1915 and 1916:

Nursery Agents Licensed.

Name.	Address.	License Expires.	
		1915.	1916.
Abbott, Reuben	Thorndike	–	Aug. 30.
Alexander, Wm. A	Ellsworth	–	Nov. 20.
Atwood, W. H.	Lisbon	July 31	–
Bagley, James E	Monroe	–	Aug. 23.
Barker, Geo	Presque Isle	–	June 8.
Barlow, L. A.	East Boothbay	Aug. 13	–
Bessey, Walter P.	Freedom, R. F. D. 17	April 7	–
Bisbee, Clinton W	West Sumner	July 20	–
Bisbee, Eddie J	East Winthrop	–	Feb. 5.
Bolton, F. O.	South Portland, 56 Ocean St.	–	July 14.
Bradeen, Arthur C.	Norway	June 3	–
Bubier, T. S	Auburn, 12 Oak St.,	–	July 7.
Campbell, John C	Steuben	Oct. 31	–
Cannon, S. T	Augusta, 183 State St.	Aug. 12	–
Carpenter, Frank	Houlton, 32 Highland Ave.	–	April 24.
Cate, Ernest W	Dresden Mills	June 4	–
Clark, F. L	New Sharon	–	June 29.
Cochran, Isaac	Caribou	July 20	–
Cole, Benj. L	Lee, R. F. D.	–	May 17.
Cole, Harold J	Lee, R. F. D.	July 14	–
Cole, J. D	Lee	–	June 11.
Colson, Manley L	Monroe	–	April 30.
Cullen, John W	Robinson	Oct. 6	–
Cummings, A. S	West Paris	July 7	–
Daggett, G. L.	Sherman Mills	June 12	–
Daggett, Lee	Strong	July 30	–
Daicy, K. W	West Scarboro	June 22	–
Dakin, E. J	Wilton	–	Mar. 1.
Davis, Albert C	South Paris	–	Aug. 30.
Davis, E. B.	Rumford	–	June 1.
Dolan, W. H.	Augusta, 22 Green St	–	May 14.
Dow, Sewall E	Old Town, R. F. D. 1, Box 88	–	Sept. 11.
Dudley, F. H	Auburn, 71 Davis Ave.	–	Oct. 6.
Dyer, Alden	Franklin, R. F. D.	–	Sept. 4.
Earle, C. H.	Lewiston	Oct. 1	–
Eaton, Samuel H	Oxford	–	July 13.
Ellingwood, A. P	Monroe	–	Feb. 12.
Elliott, Harry A.	Strong, R. F. D. 2	–	Jan. 23.
Ellis, Mrs. Nellie	Winslow	Aug. 13.	–
Ellis, R. T	Gardiner, R. F. D. 9	Aug. 28	–
Filer, B.	Monroe	Sept. 29	–
Fleming, Joseph Arthur	Grand Lake Stream	–	Sept. 13.
Furbush, E. W	Greene	–	June 9.
Foss, Sr., S.O.	Auburn, 142 Pleasant St.	May 21	–
Fowler, W. B	Monmouth, Box 5	Aug. 1	–
Fox, Percy	Sanford, Brook St	July 3	–
Gay, LaForest M.	Sebago Lake	Dec. 8	–
Gilman, H. W	South Berwick, Main St.	July 22	–
Gove, G. W	Dexter, Box 1012	Aug. 28	–
Gordon, Wilson M.	Winn	–	April 23.
Gott, J. M	Wayne	June 4	–
Grant Co., W. T	Lewiston, 95-101 Lisbon St.	May 12	–
Gray, Wm. D	Richmond, Box 241	–	May 10.
Green, M. A.	Sangerville, Box 135	–	Mar. 5.
Grover, M. E	Bethel, R. F. D. 2	–	June 2.
Hale, H. H	So. Bluehill	–	Sept. 8.
Hart, Rodney	Ellsworth, R. F. D. 1	Sept. 25	–
Harwood, A. S	Hope	–	Jan. 20.
Hodgdon, D. W	Boothbay Harbor	Aug. 28	–
Holmes, Amos E	Oakland, R. F. D. 23	July 27	–
Hooper, E. H	Cumberland Mills, 89 Lamb St.	Feb. 18	–
Huntress, Miss Sarah L.	So. Berwick, Box 263	–	Oct. 4.

Name.	Address.	License Expires. 1915.	1916.
Jackson, N. D	Fairfield, Box 436	-	June 21.
Jefferson, W. G	Portland, 346 Cumberland Ave	-	June 1.
Johnson, Harry M	Brooks	Mar. 2	-
Kendall & Whitney	Portland	Jan. 21	-
Kimball, G. E	Pittsfield	-	June 1.
Kresge Co., S. S	Detroit, Mich	May 11	-
Lawrence, Freeman N	Guilford	-	Jan. 25.
Leighton, B. F	Sullivan	-	July 3.
Leighton, I. M	Woodfords, 824 Stevens Ave	Jan. 24	-
Leonard, Frank A	Augusta, 4 Page St		Sept. 27.
Littlefield, S. L	Minot	Jan. 21	-
Lowell, C. M	Farmington, R. F. D. 1	Jan. 13	-
McCabe, George L	Chebeague Island	-	July 14.
McCabe, Leroy P	Bangor, Ohio St., R. F. D. 4	-	June 21.
McCabe, Robert F	Bangor, 53 Bowdoin St	-	Dec. 13.
McCullough, J. F	Orono, 108 Main St	-	July 22.
McKechnie, George B	Danforth	May 13	-
MacGown, Harold L	Harrison, R. F. D. 2, Box 41	-	April 29.
Marrow, John H	East Winthrop	Feb. 20	-
Marston, David	Monmouth	June 16	-
Merrill, James	Augusta, 7 School St	-	Aug. 14.
Nash, A. D	Damariscotta, R. F. D. 32	-	June 3.
Nichols, E. C., Dry Goods Co.	Bangor, 37 Main St	May 5	-
Norris, E. B	Gardiner, 117 Spring St	June 19	-
Norton, A. D	Farmington	-	Sept. 21.
Norton, Clyde C	Farmington	Sept. 12	-
Pederson & Son, S	Scarboro, Box 68	May 23	-
Pennell, Luther M	Freeport	Sept. 18	-
Perkins, Fred B	Sherman Mills	Aug. 14	-
Phillips, Milton	Madison	July 21	-
Phillips, W. H	Nicolin	-	Jan. 8.
Pinkham, C. W	Rockport	-	June 25.
Pinkham, Mrs. H. F	Boothbay Harbor, Box 444	Sept. 26	-
Pinkham, R. B	Troy, R. F. D. 1	Aug. 13	-
Porteous, Mitchell & Braun	Portland	-	April 21.
Powers, A. K	Portland, 32 Vesper St	-	Aug. 30.
Powers, E. L	Bangor, 499 Hammond St	July 14	-
Prescott, Emery	Etna, R. F. D. 1	-	July 1.
Purinton, W. S	Augusta, 25 Melville St	-	July 24.
Reynolds, Bartlett C	Woodfords, 17 Arlington St	Jan. 22	-
Ricker, A. H	No. Lebanon	Aug. 28	-
Roberts, James A	East Waterboro	Aug. 14	-
Robertson, L. C	Weld	-	July 1.
Rogers, L. S	Brownville	-	June 21.
Royal, Harold L	Milo, R. F. D. 1	Mar. 16	-
Ruhl, Edward L	Farmington, R. F. D. 1	Mar. 31	-
Savage, J. Frank	Wiscasset, R. F. D. 2, Box 57	Oct. 14	-
Sawyer, C. L	Westbrook, 13 Woodman Court	-	Nov. 4.
Schwartz, E. A	Kennebunk	Dec. 19	-
Seavey, Jedediah	Bucksport	Feb. 12	-
Senior, John C	Sanford, 7 Lincoln St	-	May 13.
Sherman, Harry L	Gorham, R. F. D. 2	Dec. 17	-
Shorey, A. A	Mechanic Falls	June 5	-
Shorey, Geo. B	Brunswick, 36 Cumberland St	Jan. 6	-
Small, R. H	Harrington	Jan. 14	-
Small, W Scott	Limington	June 10	-
Smith, Alfred J	Gardiner, 20 Plaisted St	-	July 6.
Smith, Isaac T	Strong, R. F. D	-	Sept. 7.
Smith, W. H	Waterville, R. F. D. 38	Jan. 19	-
Sprague, Sumner H	Waldoboro	-	Feb. 6.
Smith, O. P	Mexico	-	June 1.
Staples, Nicholas	West Kennebunk	-	Sept. 8.
Stewart, C. H	Unity	Nov. 30	-
Stubbs, Elmer L	Guilford	-	Mar. 18.
Stultz, Harry B	Gardiner, 184 Highland Ave	Dec. 18	-

Name.	Address.	License Expires.	
		1915.	1916.
Tash, George W	New Vineyard	-	July 20.
Taylor, Amos F	Ayers	June 17	-
Tebbetts, Oscar	Readfield	June 9	-
Thomas, Eugene	Topsham	-	May 24.
Tibbetts, J. B	Newport	Jan. 29	-
Turner, Harry M	Springvale	May 1	
Urann, H. H	East Sullivan	July 23	
Victory, A. W	Houlton	-	Aug. 17.
Wasson, L. S	Bucksport, R. F. D. 2	Aug. 17	-
Webber, Harrison W	Mt. Vernon	-	Aug. 10.
White, A. K	Lincoln	-	Aug. 30.
Whitney, Fred M	Springvale	-	Oct. 14.
Whittemore, F. H	North Leeds	May 29	-
Wiggin, C. S	Waterford	Dec. 22	-
Williams, Fairfield	Solon	-	Aug. 13.
Wilson, J. W	Northwood, N. H	-	July 22.
Wood, E. L	Unity	-	Nov. 6.
Woodman, Fred D	Winterport, R. F. D. 1	-	April 30.
Woodward, George H	Gardiner, 115 Highland Ave	Dec. 29	-
Woolworth Co., F. W	Portland	-	April 3.
Young, Melvin S	Red Beach	Sept. 12	-

NURSERY INSPECTION.

The Bureau inspected the several nurseries in the state as heretofore and certificates were issued to those having clean stock.

It is becoming very evident that the certificates issued to these various nurseries should be classified, as many are far from satisfactory outside of insect infestation and disease infection. In my opinion a Class A certificate should be given only to such nurseries as are absolutely above reproach and a Class B certificate given to those which are not receiving the culture and attention demanded in the production of first-class stock. It might be necessary even to make three grades, but there certainly should be a distinction made which will give to the purchaser an inkling of the kind of stock he is to expect.

The inauguration of state and federal regulations, with reference to quarantine on gypsy and brown-tail moth, has increased the inspection work of this Department materially, especially on Christmas greens and hardwoods. Special permits have been issued to shippers of such stock who do not carry on a regular nursery, but who obtained their stock from the pastures and woods, as grown naturally.

Two states, viz; New York and Ohio, have issued regulations quarantining against shipments of Christmas greens from sections infested with the gypsy and brown-tail moth. The New York notice of quarantine is given below:

OFFICIAL NOTICE OF QUARANTINE
STATE OF NEW YORK, DEPARTMENT OF AGRICULTURE.

Albany, N. Y., September 27, 1915.

To Whom It May Concern:

Whereas, A dangerously injurious insect, the gypsy moth, Porthetria dispar, is not lodged or established in the State of New York,

Whereas, The Secretary of Agriculture of the United States has placed a quarantine under date of July 1, 1915, upon certain towns located in several of the New England States,

And whereas, This quarantine was placed upon certain trees and forest plant products to prevent the distributing the gypsy moth,

Now, therefore, for the purpose of preventing the introduction of gypsy moth into the State of New York, I hereby order and direct, under the provisions of Article 14 of the Agricultural Law, that no coniferous trees, such as spruce, fir, hemlock, pine, juniper (cedar), and arbor vitae (white cedar), known and described as "Christmas trees," and parts thereof, and decorative plants from the area quarantined for the gypsy moth, such as holly and laurel, known and described as "Christmas greens or greenery," or any other evergreen trees, not nursery grown, shall be shipped into or received at any point within the State of New York from any of the above described quarantined districts or area, or from any portion or part thereof, and such shipment, transportation or receipt is hereby prohibited.

This order shall take effect on the date hereof and remain in full force and effect until further order.

CHARLES S. WILSON,
Commissioner of Agriculture.

The list of nurseries inspected during the last season is given in the accompanying table:

NURSERY INSPECTION.

Name of Nursery.	Date of inspection.	Acres.	Apple.	Pear, peach.	Cherry, plum.	Raspberry.	Current.	Gooseberry.	Blackberry.	Miscellaneous.	Conifer.	Hard woods.	Ornamental shrubs.	Total.	Trees condemned.
Bodge, A, R,, Dexter............	July 17...	1½	–	–	–	–	1,000	500	–	–	–	–	–	1,500	–
Casco Bay Nursery Co., Yarmouth	July 12...	–	–	–	–	–	–	–	–	–	2,500	–	–	2,500	–
Chapman, L.R., New Sharon, ...	June 28...	–	–	-	–	5,000	–	–	100	–	–	–	–	5,100	–
Chaput, J. P., Auburn...........	July 2...	–	–	–	–	3,500	–	–	500	–	–	–	–	4,000	–
Chase, Homer N., Buckfield......	July 23...	1	3,000	–	–	–	–	–	–	–	–	–	–	3,000	
Craig, R. J., Woodfords.........	July 12...	–	–	–	–	3,500	200	25	50	–	–	–	–	3,775	–
Davis, John, Surry..............	July 16...	–	–	–	–	100	100	–	–	–	–	–	–	200	–
Dudley, F. H. Auburn............	June 26...	¼	–	–	–	200	–	–	–	50	50	30	25	355	–
Eastman, A. A. ,Dexter..........	July 17...	2	–	–	–	1,000	2,000	2,000	–	–	–	–	–	5,000	–
Eveleth, R. H., New Gloucester...	July 21...	1	–	–	–	3,000	–	–	–	–	–	–	–	3,000	–
Fernald, L. W., Eliot...........	July 14...	1½	–	–	–	–	500	–	100	–	–	–	1,000	1,600	–
Furbush, E. W., Greene..........	April 26...	1	–	–	–	3,000	–	–	–	–	–	–	–	3,000	–
Glentzel, Geo., Camden..........	Nov. 9...	–	–	–	–	–	–	–	–	–	–	–	150	150	–
Goddard, L. C., Woodfords.......	July 9...	–	2	2	2	–	–	–	–	–	12	–	325	343	-
Hoyt, William, Ripley...........	July 17...	¾	–	–	–	–	–	–	–	Gin-seng gold root worm-wood.					
Inman, A. E., Silvers Mills.......	July 17...	1	–	–	–	1,500	150	150	150	–	–	–	–	1,950	–
Jackson, H. A., Portland.........	July 10...	5	–	–	–	–	–	–	–	–	500,000	500	500	501,000	–
Jordan & Co., A. F., Portland....	July 10...	½	200	27	7	200	150	20	150	–	–	–	3,500	4,254	–
Kirke, Edward, Northeast Harbor	July 14...	1	–	–	–	–	–	30	25	–	600	800	250	1,705	–
Lapham, E. A., Pittston.........	July 9...	½	–	–	–	1,000	–	–	200	–	–	–	–	1,200	–
Lombard, T. M., Auburn........	June 26...	½	–	–	–	1,200	–	–	–	–	–	–	–	1,200	–
McCabe, E. T., Palmyra.........	Oct. 20...	⅛	10	10	15	–	–	–	–	–	–	–	15	50	–
McCabe, John, Bangor..........	July 2...	¼	–	–	–	–	–	–	–	–	–	500	200	700	–

McCabe, Robert F., Bangor	Oct. 18	$\frac{1}{4}$	10	12	12	-	-	-	-	500 Maple	-	-	48	582	-
Macomber, E. R., Woodfords	July 9	$\frac{1}{2}$	50	-	12	50	25	-	50	-	-	-	-	187	-
Mahoney, Geo. L., Saco	July 13	$2\frac{1}{2}$	-	-	-	-	-	-	-	500 Maple	100,000	-	-	100,500	-
Maxim, H. F., Locke's Mills	July 9	14	-	-	-	42,000	-	-	-	-	-	-	-	42,000	-
Merrill, Mrs. H. L., Auburn	June 26	$\frac{1}{4}$	-	-	-	750	-	-	-	-	-	-	-	750	-
Miller, William, Bar Harbor	July 16	$\frac{1}{4}$	-	-	-	-	-	-	-	250	-	125	600	975	-
Mitchell Co., Waterville	July 6	5	80,000	-	1,000	-	-	-	-	-	-	3,000	4,000	88,000	-
Mt. Desert Nurseries, Bar Harbor	July 15	15	1,700	150	40	200	1,000	-	-	20,050	16,000	6,500	25,000	70,640	-
Perkins, Chas. S., E. Vassalboro	July 8	$\frac{1}{2}$	-	-	-	500	-	-	200	-	-	-	-	700	-
Perley, C. A., Winthrop	July 22	$\frac{1}{3}$	3,000	-	-	-	-	-	-	-	24	-	50	3,074	-
Phillips, W. H., Nicolin	April 29	$\frac{1}{8}$	-	-	-	375	-	-	-	-	-	-	-	375	-
Pleasant View Farm, Rockport	July 17	1	-	-	-	3,000	-	-	-	-	-	-	-	3,000	-
Plummer, J. E., So. Windham	July 10	$\frac{1}{4}$	-	-	-	375	100	100	200	-	-	-	-	775	-
Pollard, D. A., Auburn	June 26	$\frac{1}{2}$	-	-	-	1,500	-	-	-	-	-	-	-	1,500	-
Roak & Co., G. M., Auburn	June 26	$\frac{1}{8}$	-	-	-	-	-	-	-	50	-	-	200	250	-
Smith, T. W. A., Biddeford	July 13	$\frac{1}{8}$	-	-	-	-	-	-	-	-	-	-	50	50	-
Strout's Nursery Co., Biddeford	July 17	$\frac{1}{4}$	-	-	-	-	-	-	-	2	6	-	200	208	-
Twitchell, Dr. G. M., Monmouth	July 21	$\frac{1}{8}$	-	-	-	250	50	50	-	-	-	-	-	300	-
Worcester, E. W., Ellsworth	July 15	1	-	-	-	3,000	-	-	-	-	-	-	-	3,000	-
Conant, W. H., Buckfield	Aug. 19	1	-	-	-	1,000	-	-	-	-	-	-	-	1,000	-
Davenport, E. M., Hebron	Aug. 20	$\frac{1}{8}$	-	-	-	-	-	-	400	-	-	-	-	400	-
Hussey, J. C., Oakland	Aug. 12	1	-	-	-	750	-	-	-	30	20	-	600	1,400	-

INSPECTION OF IMPORTED NURSERY STOCK.

During the year the Bureau has inspected 43 shipments of foreign nursery stock. The greater part of this stock has been roses and azaleas, with a few small shipments of other plants. Stock was exceptionally clean this year, with practically no insect infestation. Some of the roses were quite badly mildewed and in several instances the azaleas had been too freely watered. The larger part of these shipments come from Holland and Belgium, and it is particularly noticeable that this stock has not been curtailed to any great extent because of the war. Stock has come through with little delay, the only apparent disadvantage being a considerable increase in the price and transportation charges. The florists, generally, are beginning to take more and more of this stock.

The following table shows the number of plants, number of shipments and native country of the different plants brought in:

Name of Plant.	Number of Shipments	Number of Plants.	Native Country.
Araucaria	2	65	Belgium
Aristolochia	1	50	Holland
Azalea Indica	24	2369	Belgium
Berry Shrubs	1	100	Canada
Boxwood	1	100	Holland
Clematis	1	100	Holland
Dwarf Roses	1	100	England
Hydrangea	2	225	Holland
Palms	2	23	Belgium
Rhododendron	1	50	Holland
Roses	8	4467	Holland
		2195	Ireland
Spiraea	1	100	Holland
Sycamore	1	2	England
Tree Hydrangea	1	10	Holland

NEW ENGLAND FRUIT SHOW.

The Fruit Show at Boston this fall was held at Mechanics Building, in connection with the Indoor Country Fair, a plan which the management hoped would remedy the lack of interest so noticeable in former years when the show was held in Horticultural Hall and consisted of only horticultural displays and exhibits.

The Exhibition was carried on after the manner of typical country fairs, with the midway for the most part in the basement and the main exhibits, consisting of fruit, vegetables, ornamental shrubs and flowers, birds and animals, on the first and main floor.

The frutit exhibit attracted by far the most attention and was the principal feature of the fair. The plate exhibits were unusually large and an opportunity was afforded visitors to see some exceptionally good fruit in fancy grades. Beyond these exhibits was the display given by each state, each of which had its own representative booth. The Vermont management should be given a great deal of credit for the manner in which the fruit from that state was displayed and advertised, and the plan of giving away a Vermont apple with each ticket on certain days proved to be an excellent one.

The Connecticut display was made up of some excellent fruit, but the plan of sorting over 1,000 barrels, from one or two orchards, for an exhibit of 50 boxes, hardly seems a practical method for the average fruit grower to adopt.

The Rhode Island and Massachusetts displays consisted mostly of fruit from one or two large growers of each state, and was undoubtedly selected in much the same way as the fruit from Connecticut. The Windsor Brothers, from the former state, had exhibits of fancy and commercial fruit packed in both barrels and boxes. Their fruit was of the best quality, as was that of A. A. Marshall of Fitchburg, Mass., whose McIntosh Reds are famous throughout New England.

With the exception of a few plates and boxes, the Maine exhibit was shown in the form of a commercial pack, and as only a few fruit growers were represented and but a small amount of fruit shown, it is plain that steps should be taken very soon to give Maine orchardists more encouragement and incentive to defend and hold the title of the best fruit growing state in New England, which our state rightfully deserves.

On account of the failure of the show financially, Mr. Brown, the secretary of the management of the Fruit Show, through W. H. Conant, representative from Maine, obtained

Commissioner Guptill's permission to pay for the premiums which were won outside of the Maine Special Contest. As there was a large balance from this appropriation not awarded, the $20 asked for could be taken from the same.

The following is a list of prize winners from Maine:

Oxford Bears Fruit Growers' Association, Hebron.
$50 00 For the best ten barrels of apples,
Maine Special, Sec. B.

Clement & Taylor, Winthrop.
$40 00 For the best five barrels of apples,
Maine Special, Sec. A.
15 00 For best barrel of Roxbury Russets,
2 00 For third best plate of Yellow Bellflowers,
1 00 For third best plate of Opalescents,

$58 00

W. E. Martin, West Minot.
$35 00 For second best five barrels of apples,
Maine Special, Sec. A.

E. E. Page, East Corinth.
$30 00 For third best five barrels of apples,
Maine Special, Sec. A.

C. F. Sawyer, Hebron.
$15.00 For best barrel of apples, Maine Special, Sec. C.
2 00 For best plate of Oxford Blacks,
10 00 For best box of apples, Maine Special, Sec. D.

$27 00

M. A. and L. E. Bass, Wilton.
$25 00 For fourth best five barrels of apples,
Maine Special, Sec. A.

H. P. Sweetser, Cumberland Center.
$20 00 For fifth best five barrels of apples,
Maine Special, Sec. A.

A. L. Blaisdell, Winterport.
$15 00 For sixth best five barrels of apples, Maine Special, Sec. A.
S. C. Blaisdell, Winterport.
$10 00 For seventh best five barrels of apples, Maine Special, Sec. A.

Berry & Allen, East Hebron
$10 00 For second best barrel of apples, Maine Special, Sec. C.

Roy Cordwell, Hebron.
$5 00 For second best box of apples, Maine Special, Sec. D.

$285 00 Total prizes won by Maine exhibitors.

SECOND CARLETON ORCHARD CONTEST.

In compliance with the stipulation governing the Carleton Orchard Contest fund, the Second Contest was started by the Department of Agriculture in the spring. In December, 1914, posters concerning the contest were sent to the various postmasters in the state with a request that they be placed conspicuously in the post office.

Cards showing the address location of the orchard, best means of reaching the orchard, and a pledge to live up to the conditions of the contest were mailed to each applicant. Upon receipt of these cards properly filled out, the Department forwarded a circular of information containing a list of the prizes offered, score card for judging, tables showing the number of trees required for different systems of planting, maximum and minimum distance apart for the leading varieties, and the regulations governing the contest.

Early in the spring report sheets were sent to each contestant to be filled out and returned to the office when the work on the orchard was completed for the season. These sheets called for a definite description of the orchard, the work done and the materials used; in addition a complete report of the expenses connected with the trees and a report of the expenses and receipts on any crop or crops grown in connection with the trees.

Seventy-six growers signified their intention of entering the Contest. Of this number, six failed to plant trees. The reasons given were unsatisfactory condition of the ground, too few trees for an acre, and failure to receive trees at the proper time. The net result represents a decrease of 108 orchards, in comparison with the first contest. Washington county is not represented, while Aroostook county was not represented before.

Either Mr. Wilkins or I visited each of these orchards in the growing season, took notes concerning them, and made whatever suggestions seemed necessary concerning their management.

The wet season proved a serious handicap, especially to those orchards under cultivation where the natural drainage was poor. In general, however, the trees have been very well handled and, notwithstanding the fact there are fewer contestants, there is reason to believe that this contest will prove more satisfactory than the first and that the competition will be much keener.

SUMMARY (65 ORCHARDS).

Number plowed	48
Number in sod	16
Number dug around	1
Two year trees set in	55
One year trees set in	7
Three year trees set in	3
Dynamite used in planting in	12
Fertilizer used in	55
Spraying done in	31
Largest number of trees per acre	111
Smallest number of trees per acre	25
Average number of trees per acre	45.8
Popular number of trees per acre	40
Number of Stark trees planted	831
Number of McIntosh trees planted	692

Number of Spy trees planted	304
Number of Wolf River trees planted	268
Number of Delicious trees planted	217
Number of Wealthy trees planted	204
Number of Baldwin trees planted	172
Number of scattering varieties	293

Data on Costs.

Nature of Expense.	Number of orchards.	Number of trees.	Total cost.	Cost per tree.
Preparation	55	2,578	$418 35	$.162
Trees	65	2,981	834 71	.28
Setting	65	2,981	415 06	.139
Fertilizing	55	2,577	286 77	.111
Cultivation	43	1,922	77 88	.04
Mulching	19	884	36 91	.041
Protection of trunk	49	2,166	48 75	.022
Spraying	31	1,346	26 48	.019
Total	65	2,981	$2,144 91	$.7188
Total, less preparation	65	2,981	1,726 56	.579

The following is a list of the contestants entered in the Second Contest:

CONTESTANTS IN SECOND CARLETON CONTEST.

Androscoggin.

Newell, George Clifford .... Turner
Newell, George E. .... Turner
Newell, Harry S. .... Turner
Raymond, George .... R. F. D. 1, Lewiston

Aroostook.

Watt, A. C. .... Mapleton

Cumberland.

Batchelder, Perley D. .... R. F. D. 2, Naples
Chute, James C. .... Naples
Dolloff, E. W. .... Standish
Flint, Arthur E. .... R. F. D. 2, Bridgton

Flint, L. H. . . . . Walnut Hill
*Hawkes, Delmont R. . . . . Sebago Lake
Laughton, W. T. . . . . Walnut Hill
Libby, Wilbert A. . . . . R. F. D. 2, Sebago Lake
Rand, Frank H. . . . . Standish
Savary, Nathan C. . . . . Naples
Sweetser & Son, Fred R. . . . . Cumberland Center
Warren, Walter L. . . . . West Baldwin
Wiley, Joseph H. . . . . Naples

Franklin.

Mosher, L. W. . . . . Wilton
Mosher, Miss Ruth E. . . . . Wilton
Wheeler, Charles E. . . . . Chesterville

Hancock.

Morang, C. L. . . . . Ellsworth
Phillips, W. H. . . . . Nicolin

Kennebec.

Hinds, William C. . . . . Winthrop
Hinds, W. E. . . . . Winthrop
Lee, F. W. & M. T. . . . . R. F. D. 5, Augusta
Norcross, Earl S. . . . . Winthrop
Russell, Luther S. . . . . Kent's Hill
Ridley, Charles A. . . . . Oakland

Knox.

Caudell, J. M. . . . . R. F. D. 1, Box 88, Union
Creighton, Frank G. . . . . Union
Hobbs, Miller B. . . . . Union
Thurston, Raymond E. . . . . Union

Lincoln.

Walker Bros. . . . . R. F. D. 1, Wiscasset

Oxford.

Bearce, H. W. . . . . Hebron
Bryant, James I. . . . . Buckfield
Bryant, J. B. . . . . R. F. D. 2, Buckfield
Chase, Thomas E. . . . . R. F. D. 2, Buckfield
Davis, Owen R. . . . . Bryant Pond
Deering, A. L. . . . . Denmark
Maine Sanatorium Farm, N. K. Austin, Supt. . . . . Hebron
Spaulding, Stephen J. . . . . R. F. D. 1, Buckfield
Walker & Son, Frank L. . . . . Oxford

Penobscot.

Bragger, Bessie W. . . . . R. F. D. 3, Dexter
Bragger, W. B. . . . . R. F. D. 3, De
Colbath, Frank M. . . . . R. F. D. 1, Carmel
Delano, Lee D. . . . . R. F. D. 1, Box 43, Lee
Eichberg, Theodore . . . . R. F. D. 1, Bangor
Raynes, Lillie B. . . . . 10 Columbia Bldg., Bangor
*Redman, Samuel J. . . . . Exeter
Smith, Earl G. I. . . . . R. F. D. 2, Box 36, Dixmont

Piscataquis.

Lee, Lyman K. . . . . Foxcroft

Sagadahoc.

*Butler, Charles Henry . . . . Woolwich
Guptill, Samuel . . . . Topsham
Harris, H. M. . . . . Pejepscot

Somerset.

Goodrich, C. W. . . . . 257 Madison Ave., Skowhegan

Waldo.

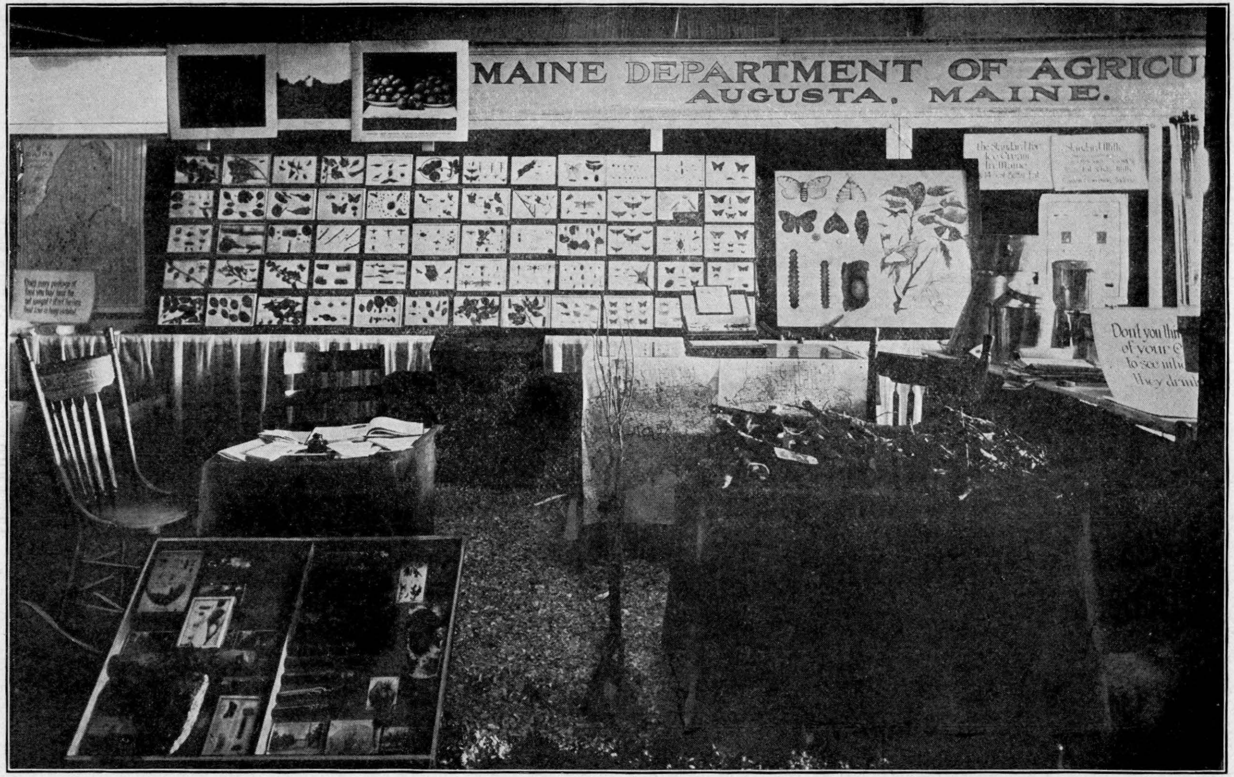
Blaisdell, A. L. . . . . R. F. D. 2, Winterport
Blaisdell, Silas C. . . . . R. F. D. 2, Winterport
Brewster, Carl S. . . . . East Searsmont

Hills, Irvin O. . . . . Star Route, Belfast
Keene, Frank Henry . . . . Belfast
Morrill, Willard A. . . . . Belmont
Treat, Miss Gladys E. R. F. D. 3, Monroe
Treat, Leonard M. . . . . R. F. D. 3, Monroe
Vaughan, William, Jr. . . . . Searsport Ave., Belfast

York.

Dyer, Algernon S. . . . . Bar Mills
Elwell, Albert T. . . . . West Buxton
Leavitt, Leonard C. . . . . R. F. D. 2, Kezar Falls
Rounds, Thurston P. . . . . West Buxton

*Report not received.



Gypsy Moth exhibit at the Exposition in Portland, June, 1915.

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

Hon. W. T. Guptill, Commissioner of Agriculture:

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

In every generation there appears a personality or an individual existence that creates an epoch or formulates an era; this is true in all life, plant or animal. Each constitutes a force that sometimes deals with the serious problems of life and again it becomes a vital spark that flares, flashes and threatens to destroy the industrial problems of communities.

Every community has its individual aspect, either adorned by nature, or enhanced and beautified by man. The greatest beauty and best asset which any community can boast, is shapely trees, with a profusion of luxuriant foliage. Nothing is more forbidding to the sight than ill shaped trees, with a scanty bearing of thin, ragged, skeletonized leaves, that afford neither beauty nor shade, standing only as a disgrace to the premises on which it grows. Nothing is more worthy of our care, no expense too great to protect and preserve them from the destruction which today threatens both our shade and fruit trees with the devastation and ravages of the gypsy moth.

I will not summarize this report with a digest on the life history and habits of the moth in this country. Its introduction, habits and spread have been so repeatedly told through the columns of the public press and public platforms that I deem it superfluous to this report. However, it is well to mention a few incidents connected with the ravages and devastation of the pest, in the old country, especially in Southern Europe and Asia. All the writers on European entomology state that it is replete with the destruction caused by the gypsy moth; and when authenticated by the records of such notable and eminent entomologists as herein given, there can be no shadow on which to base a doubt. Those records should urge us to greater expediency—greater efforts to suppress and stamp out this ravaging pest.

Frisch, in 1720, records the stripping of the celebrated lindens from Neustadt to Berlin. Schaeffer, the defoliation of entire forests in 1752 at Althenburg, Leitz and many other places. The stripping of the cork oaks in Southern France in 1731, recorded by Brown, again recorded by others in the early 18's. Other well-known entomological writers of a later period, such as Ratzeburg, Bazin, Portchinsky and Keppen, have each recorded the notable outbreaks of this pest.

In 1828, Daudeville describes an outbreak extending sixty-five miles at Saint-Quentin, when the gypsy moth absolutely denuded the trees, giving them the appearance of dead timber. The ravages and destruction of the moth was so great at this time that churches remained open for prayer, penitence and fasting; they created terror in the hearts of all and was thought to be a visitation and wrath of heaven.

Another incident not to be forgotten was when the whole world stood aghast at the threatened destruction of the entire Black Forest of Germany, which was saved only by diligent and combined efforts of the citizens and soldiery of the nation.

Our intelligence should cast no doubt on any record noted by these eminent writers, but should teach us and instill in us a dread lest they burst the bounds of suppression and create the havoc and destruction, not only in this state, but in this whole country. They are the most feared and most formidable pest in the universe.

Yet, many in our state are prone to look upon it as a not too serious pest, while in reality the slightest infestation is so serious as to prove a calamity if not stamped out in its incipiency. When we consider the insect world to be four hundred times greater than any other, we are considering a magnitude unbelievable; nevertheless, such is a fact. Individually, an insect is an insignificant creature and receives but scant notice from man, and, if unmolested, will soon assume proportions approaching that crisis that man must act and use every endeavor at his command to control and preserve the remnant it has not destroyed.

Just such a period is now in progress in the State of Maine. The gypsy moth infestation extends from Kittery, south, to Corinth, north; from New Hampshire, west, to Thomaston, east.

There are 197 towns and cities today infested with the pest. The past season was devoted to checking the spread of the moth—a task satisfactorily accomplished. While trained scouts were kept in border towns, preventing the dispersion of the moth, other crews were engaged preventing the increase and reducing the badly infested colonies in southern Maine.

The whole field force, under the supervision of able and efficient inspectors, are proud of the work accomplished in their respective territories; they are unanimous in deploring the fact that they were obliged to work with $5,000 less appropriation than in preceding years. The $5,000 deficit would have enabled us to stamp out the few isolated colonies, as I planned; but I realized the futility of an attempt in those places without proper means of support. In such colonies we could only content ourselves by preventing further increase.

PARASITISM MISUNDERSTOOD.

I wish to call attention to the large number of persons who erroneously think they are preserving the parasite; they cut the brown-tail webs during the winter months, and early in the spring place them in a barrel. They then smear the inside chimes of barrel, or other receptacle, with tangle-foot, or other sticky substance, thereby confining the caterpillar, until it emerges from the web, at the same time liberating, as they have been taught to believe, the parasites. This is all wrong. The parasite is safely ensconsed within and feeding on the vitals of the caterpillar.

The minute fly, so often found in the brown-tail webs, known as the Monodontomerus, is a parasite of so little importance that those who have taken this method to preserve the parasite have imposed a needless and fruitless task upon themselves. If, instead of destroying, they fed the caterpillar in that barrel, until the time the beneficial parasite (Apanteles lacteicolor) emerged from the carcass of the caterpillar and completed its cycle of life, they would be rewarded for their efforts, by preserving the parasite, which, it is hoped, will eventually control and stamp out the brown-tail pest.

Then there is another class of people who are so blind to their own interests, they absolutely refuse to do anything whatever to help themselves, their neighbors, or the state; their selfish, indolent natures invite daily the justified scorn and contempt of the community. There should be a law carrying a penalty and such people should be amenable to that law.

The people of this state must realize they are fighting the most serious pest known to science; they must also realize, that the annual damage done to crops in the United States is over $400,000,000 by lesser insects than the gypsy moth. It behooves us to prevent further inroads in the progress of this ravaging pest—a task that cannot be accomplished for less than $50,000 annually. The people who suffer from the destruction caused by the gypsy moth are the people who should appear before the legislative committee and demand money sufficient to combat this pest effectively, and less than $50,000 is not sufficient.

The gypsy moth work, this year, began on the first day of April and continued until August 16, when the men were laid off until the first of October, at which time we renewed operations with a few crews of picked men.

After carefully considering the work done in the past, and drawing conclusions therefrom, I formed plans for the past year and I had the men strictly follow those plans, with the result that our success was greater than our anticipations.

Crews of men have worked in the following towns and have destroyed, in each town, the number of gypsy moths as tabulated below:

GYPSY MOTHS DESTROYED.

	Larvae.	Pupae.	Egg-Clusters.	Moths.	Burlaps.	Trees. Sprayed.
Baldwin			10,466			
Bath	7,836	893	16,964	4	446	1,132

Biddeford	535,440	890			1500	4,560
Bowdoinham			19,244			
Bowdoin			1,700			
So. Berwick			63,500			
Bristol			127			
Bremen			2			
Brunswick			300			
E. Boothbay			6			
Cape Elizabeth			171			120
South Casco			255			
Cornish			1,384			
Damariscotta			8			
Durham	338	65	273	3	174	358
Glenburn		1	1			
Gorham			24,033			
New Gloucester	10,857	223	1,461	5	861	80
Kittery			21,139			
Monmouth			85			
Newcastle			12			
Parsonsfield			5,021			

Portland	33,983	8,939	847		149	72
So. Portland	23,200	1,181	12,166	82		
Saco	316,132	1,422	3,218	121	1,000	
Sanford	414,722	33,484	175,958	15,553	1,717	
Scarboro	43,492		774			
Topsham			726			
Thomaston			422			
Wiscasset			89			
Wells	57,235		32,138		1,000	1,916
Woolwich	2,700	144	1,088	2	178	173
So. Windham			36,977			
York	617,221		57,704		1,000	
Eliot	113,844	290	3,794		1,000	
Standish			714			
Cliff Island			21			
Jewell Island			87			
Bombazine Island			602			
Peaks Island			947			

Totals.

Egg-Clusters.	Larvae.	Pupae	Imago.	Burlaps.	Trees Sprayed.
484,224	2,170,000	37,532	15,770	10,000 Yds.	7,791

BORDER SCOUTING.

Orrington, South Orrington, Brewer, Eddington, Orono, Glenburn, Kenduskeag, Corinth, Exeter, Stowe, Lovell, Stoneham, Mason, Fryeburg, Academy Grant, Batchelder's Grant, Gilead.

FINANCIAL REPORT.

Field labor	$21,898 32
Traveling expenses	1,569 81
Supplies	1,432 64
	$24,900.77

TOWNS VISITED BY REQUEST.

Richville, Freeport, Alna, Waldoboro, Rockport, Rockland, Camden, Friendship, Calais, Bangor, Gardiner, Bethel, Bridgton, Kennebunk, Kennebunkport, Sebago, Waterboro, North Chatham, Newfield, Lyman, Brownfield, Machias, Alfred, Springvale, Berwick, North Berwick, Yarmouth, Buxton, South Paris, Mt. Desert, Bar Harbor.

Number of letters received and answered, 362.

Sets of colored cards distributed, illustrating the life history of gypsy moth, brown-tail moth and Calosoma beetle, 400.

Respectfully submitted,

ED. J. CADEY,

Special Field Agent.

REPORT MAINE PARASITE LABORATORY.

The parasite work for the summer of 1915 is now finished and I beg leave to submit my report of the work accomplished under my direction at the Maine Parasite Laboratory.

In some ways the season was far from satisfactory, but, on the whole, I am not entirely disappointed in the amount of work that we have been able to accomplish, though of course I should have been very much pleased had the season been more to our advantage.

My first care after arriving in Portland in May was to get the notes of the two preceding years copied upon the new sized note slips. This took about two weeks, as they were in such a chaos that considerable study was necessary in order to get them arranged correctly.

As soon as the foliage on the wild cherries was sufficiently advanced in growth, I removed part of the brown-tail webs from cold storage where they had been since collection, and started forty trays of one hundred webs each. A week later the remainder of the webs were removed from storage and placed in trays. From the starting of the webs until the first of July the entire time was taken with caring for the trays and colonizing the parasites obtained. The number of Apanteles obtained was not quite as many as I had hoped for, but, considering the short time this species has been in Maine and the setback it suffered, owing to the severe winter of 1913-1914, the results were very satisfactory.

Following is a detailed report of the number of Apanteles and Meteorus cocoons obtained from the webs:

Kennebunk	1700	webs	gave	1025	Apanteles	and	234	Meteorus
Wells	1300	"	"	937	"	"	691	"
So. Berwick	400	"	"	369	"	"	89	"
York	1600	"	"	1234	"	"	511	"
Eliot	1700	"	"	5551	"	"	932	"
Kittery	900	"	"	1412	"	"	400	"
Portland	100	"	"	188	"	"	36	"
Totals	7700	webs		10716	Apanteles		2893	Meteorus

Work of Gypsy Moths in woods, Sanford.

In addition to the above number of Apanteles and Meteorus, about 3,600 were shipped to us from the United States Gypsy Moth Parasite Laboratory, Melrose Highlands, Mass., making a total of about 14,300 Apanteles and 2,893 Meteorus for colonization. These were colonized as follows:

	Apanteles	Meteorus
Bethel	1000	
Calais	1000	
Carmel	1000	
Columbia Falls	1000	
Danforth	200	500
Dennysville	1000	
Foxcroft	1000	
Gilead	800	
Jay	1000	
Lincoln	200	500
Machias	1000	
Mattawamkeag	200	500
Medford	1000	
Mexico	1000	
Sherman	900	1400
Solon	1000	
Strong	1000	

As soon as the brown-tail work was completed we endeavored to make collections of Calosoma in some of the towns in the extreme southern part of the state. A preliminary survey of the towns most likely to give the best results showed that, though the beetles might be present in sufficient numbers to warrant collection, the trees were so large as to render the work very difficult. For this reason two men were sent to Melrose Highlands and, under the direction of C. W. Collins, collected eight hundred beetles from towns in that vicinity. These were shipped here, together with nine hundred supplied by Mr. Collins, and the entire number, with the exception of about 100 which died en route, was colonized at the rate of 50 males to 50 females to each colony.

One colony was placed in each of the following towns: Bath, Newfield, New Gloucester, North Yarmouth, Sebago, Standish, Woolwich and Yarmouth, while two colonies were placed in each of the following: Cornish, Limerick, Limington and Parsonsfield.

While the beetles were being colonized, collections of gypsy moth larvae were being made from some of the towns located south of this city where Compsilura had been present in previous years. It was apparent very soon that we were not going to get a very large number of the above named parasite from these collections, especially as the wilt was killing a large percentage of the larvae. The collections were continued, however, on the chance that some of them might give good results, but we were finally forced to discontinue this line of work as the season became too far advanced to make any more collections advisable.

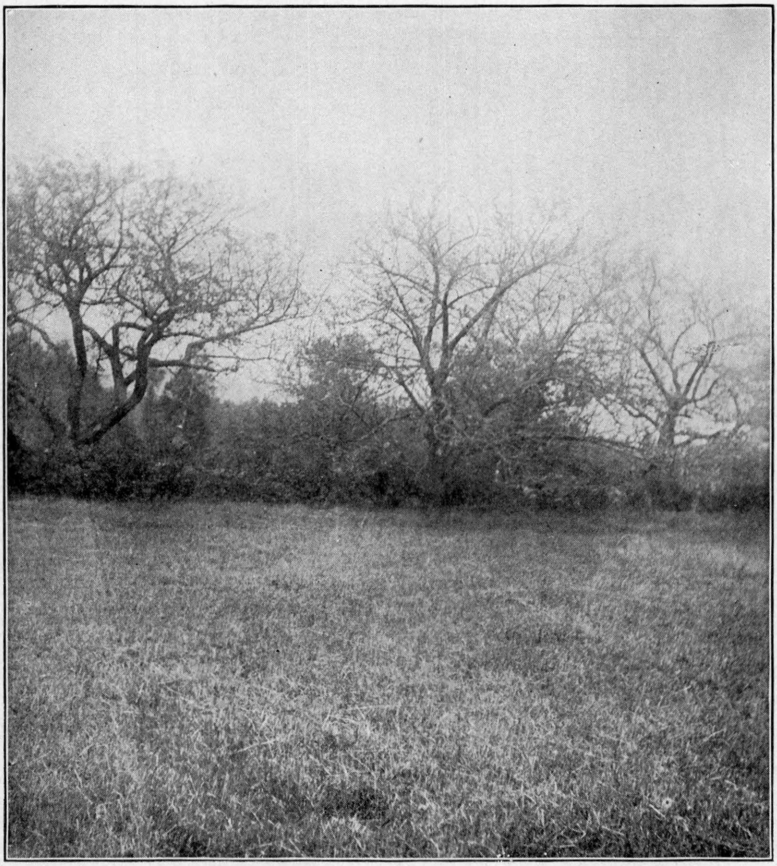
The following is a detailed report of the results of our Compsilura work:

Berwick	2500	larvae	collected	137	Compsilura	obtained
Eliot	6500	"	"	222	"	"
Kittery	4000	"	"	254	"	"
Sanford	3000	"	"	47	"	"
So. Berwick	1000	"	"	61	"	"
York	3600	"	"	21	"	"
Totals	20600	"	"	742	"	"

In addition to the number of Compsilura listed above, we received from the United States Laboratory two colonies of five hundred each.

The above three lots of Compsilura have been or will be colonized in Jay, Oakland and Knox.

This completes the report on the work for the past summer. It might have been possible to obtain more Compsilura if the work had been continued for two or three weeks more, as this parasite began to appear in more satisfactory numbers toward the end, but I do not believe that a continuance would have been advisable, in view of the fact that the men in other branches of the work were going to be laid off on August 15 and, besides, I had entirely too many men here for the amount of work on hand and it would be rather unfair to keep some of them and terminate the employment of the others.



Work of Gypsy Moths on old apple trees, Upper Gloucester.

At the present time I am not quite prepared to submit a plan for the conduct of the work for next year; before doing so I wish to make a study of some of the Government notes. This will only take a short time, however, and as soon as I can go over the above mentioned notes I will make out a plan and send you a copy. I believe that Mr. Cleary will be the man for you to put in charge of this work next year.

Respectfully submitted,

JOHN N. SUMMERS,

Scientific Assistant United States Bureau of Entomology.

PARASITES OF THE GYPSY AND BROWN-TAIL MOTHS IN MAINE.

Before considering the parasites of the gypsy and brown-tail moths which have been introduced into the State of Maine, it is necessary to explain briefly the subject of parasitic control of injurious insects in order that the difficulties encountered in controlling insects by this means may be understood.

The control of injurious insects by their enemies is a subject which needs some light thrown on it to remove certain erroneous ideas which appear to be common. The impression seems to be current that these enemies are miracle workers capable of performing astounding feats of destruction and that it is only necessary to liberate a few of them in a locality suffering from the work of some injurious form, to have this latter disappear at once. Unfortunately such immediate destruction is not possible in the majority of cases, and we have to be content with a more gradual removal. These enemies only increase at a certain rate and under the most favorable conditions; considerable time is required for them to become numerous enough to make their efforts noticeable, especially if the injurious forms they attack have been present for a number of years and have increased unmolested.

Insects in their native homes are usually kept quite effectively under control by their enemies, but if any factor favorable to them is introduced to disturb this arrangement they are apt to increase enormously. Such disturbance takes place when they are accidentally taken from one country to another and if the conditions in the new home are favorable they are very apt to increase by leaps and bounds until they become serious pests, the amount of damage depending on the value of the crop attacked. If such an insect becomes established it is necessary to introduce those forms which were responsible for the control in its native country. These beneficial forms after introduction must first become acclimated; they must increase in numbers and finally they must spread over the territory occupied by the pest they attack. When these three steps have been accomplished we begin to have real benefit from their work; but all this takes time and the proverb that "a stern chase is a long one" applies to insects as well as it does to other things.

While this increase of beneficial forms is taking place the pest is also increasing and damage is resulting from its work so that it becomes necessary for man to adopt some means of fighting it until such time as the parasites increase sufficiently to do this fighting for him.

Certain injurious forms may be controlled by one enemy but many require a number for this work, all working together and each doing its share, and it is to this latter class that the gypsy and brown-tail moths belong. It is, therefore, evident that we shall only get control of these pests when we have the various enemies responsible for this control in their native homes well established in this country over the entire area occupied by them.

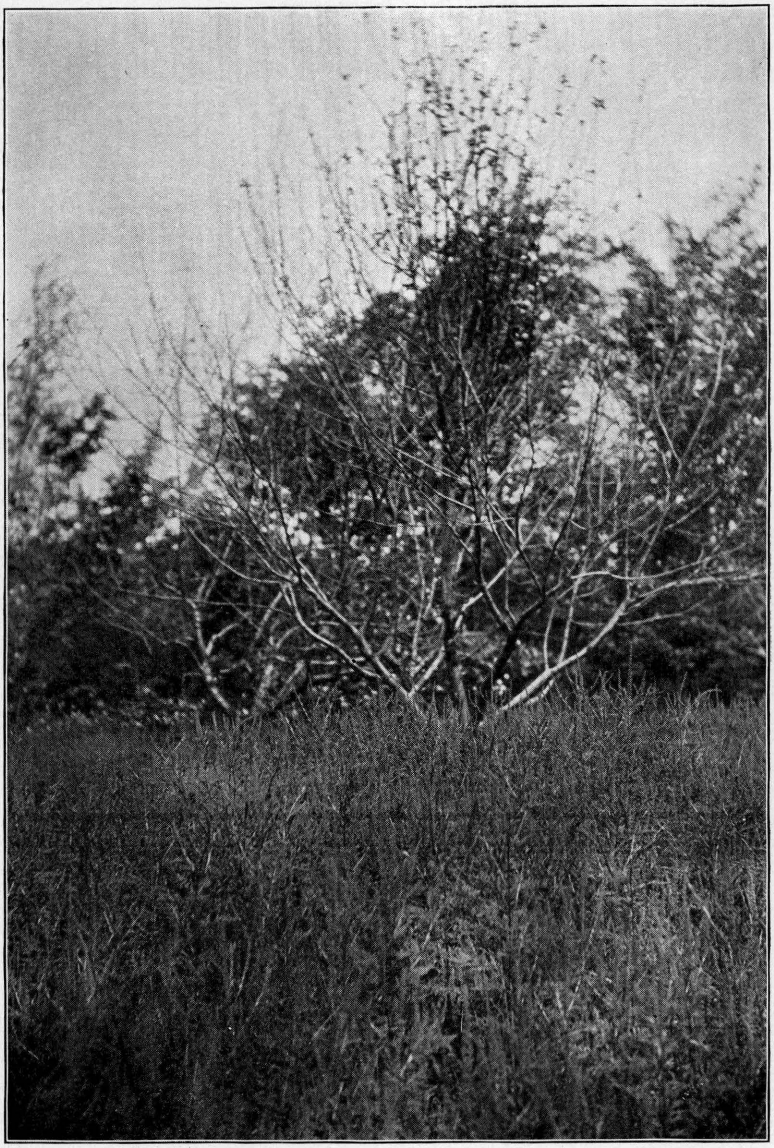
The United States Bureau of Entomology has been devoting a large amount of effort, during the last few years, to the study of enemies of the gypsy and brown-tail moths. A considerable number of these has been imported from Europe and established in this country. The men engaged in this work are now helping along the natural spread of these enemies by collecting them from sections where they have become abundant and liberating them in sections to which they have not had time to spread. Five of these enemies are at present established in Maine but such a short time has elapsed since their introduction that it is somewhat early to expect any great benefit from their work, though, of course, every particle of work that they do is of considerable value. The distribution of the parasites over as large a territory as is occupied in Maine by the two pests cannot be accomplished in a short time though already long steps in this direction have been made. It should be clearly borne in mind, however, that this distribution is only the first part of the work. It is the only part of the work that man can attend to as the other steps, increase and spread, are taken care of by the insects themselves and there appears to be no way by which we may speed up the process.

When the enemies of the gypsy and brown-tail moths were first introduced into New England they were subjected to careful study by the men employed for this work. The factors connected with their lives were carefully studied, including the distance they would spread, naturally, after becoming well established, and it was from the mass of information thus acquired that the present plans of putting out new colonies were devised. The entire area occupied by the gypsy and brown-tail moths was divided into squares by drawing lines on the map at right angles to one another, twelve and one-half miles apart. Colonies of parasites are planted as near the intersections of these lines as possible. Three of the parasites are colonized according to this plan—Apanteles lacteicolor and Meteorus versicolor colonies are planted at each intersection or twelve and one-half miles apart, while Compsilura concinnata colonies are planted at every second intersection or twenty-five miles apart. Anastatus bifasciatus, the egg-parasite, is colonized according to the plan given below under that insect, while Calosoma sycophanta colonies are planted wherever the gypsy moth is abundant enough to warrant such planting, provided these colonies are at least two miles apart. These plans of liberating the parasites have been carefully followed as they are believed to be the ones most calculated to give the best results. Letters are often received requesting the liberation of parasites on the property of the writer and when such liberation does not seriously interfere with the above mentioned plans an endeavor is made to accede to the request, but it is very easily seen that it would be entirely impossible to grant all such requests without interfering with our plans and, besides, the amount of material at our command is entirely inadequate for such extensive work.

A brief history of the parasites thus far introduced into Maine follows:

ANASTATUS BIFASCIATUS.

This insect is one of the two parasites attacking the eggs of the gypsy moth which have been successfully introduced into the United States. Its eggs are deposited inside the gypsy eggs and the maggots which hatch from these devour the entire contents of the gypsy eggs. They pass the winter in the empty



Effect of work of Gypsy Moths on young apple trees, near the Trull Hospital, Biddeford.

shells and emerge as very small black fly-like insects just before the new lot of gypsy eggs are laid in late summer. This parasite is a very satisfactory enemy after it becomes well established. It will destroy from one-fifth to one-third of the gypsy eggs but it is so small that the spread is very slow and for this reason we are compelled to put out new colonies quite near together to make any impression on the gypsy infestations. One thousand gypsy eggs containing parasites are used for each colony; these are placed in a small tin can with holes in the side through which the insects can escape and the can is nailed to the side of a tree. These colonies are placed on both sides of roads at quarter mile intervals wherever there are a sufficient number of gypsy moth egg-clusters present to warrant such planting.

Last spring was the first season that colonies of this parasite were put out in Maine. Following the plan just outlined the towns of Kittery, Eliot, York, South Berwick, Berwick, North Berwick, Wells, Sanford, Kennebunk, Kennebunkport, Dayton, Saco and Biddeford were colonized.

APANTELES LACTEICOLOR.

This parasite attacks both the brown-tail and gypsy moths. It spends the winter as a small maggot inside of the young brown-tail caterpillars and as soon as these emerge from the webs in the spring, begins feeding on the body contents of its host. It becomes full grown and emerges to spin a small white cocoon about the last of May, killing the caterpillars at the same time. In a short while the adults, which are small black fly-like insects, emerge from these cocoons and attack the young gypsy caterpillars, killing them in the same way. Shortly after the young brown-tail caterpillars hatch from the eggs in late summer they are attacked by the adults of this parasite; eggs are deposited in them and these hatch to produce the small maggots mentioned above as passing the winter.

This parasite was first recovered in Maine from the town of York in the spring of 1912, probably having spread there from some one of the towns in New Hampshire. By 1913 it had spread as far north as Waterboro and Saco. That year the first attempt was made by the authorities of Maine to obtain a large number of them for liberation. From brown-tail webs supplied by the United States Gypsy Moth Laboratory at Melrose Highlands, Mass., a sufficient number of the parasites were bred to plant colonies of 1,000 each in the towns of Buxton, Gorham, Portland, New Gloucester, Lisbon, Yarmouth, Gardiner, Wiscasset, Newcastle, Readfield, Pittsfield, Dexter, Winterport and Old Town. The following year a continuance of this work gave a sufficient number of parasites to plant colonies in Brunswick, Norway, Paris, Turner, Monmouth, Warren, Camden, Knox, Belfast, Ellsworth, Bar Harbor, Sullivan, Cherryfield, and on Peaks Island. This spring additional work with this parasite was done and colonies were planted in the towns of Gilead, Bethel, Mexico, Jay, Strong, Solon, Lincoln, Medford, Mattawamkeag, Danforth, Foxcroft, Columbia Falls, Machias, Dennysville, Calais and Carmel.

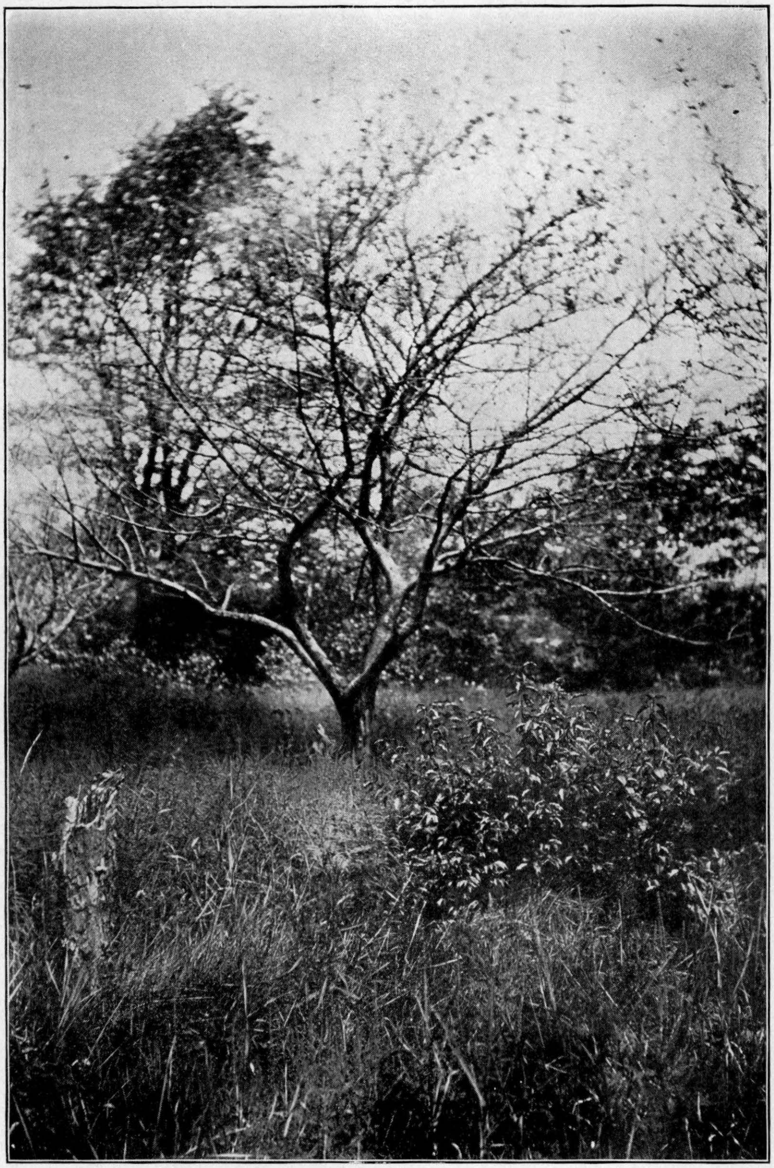
From year to year, collections of brown-tail webs from towns where the colonies were planted have given some of the parasites, which show that the species has become established and in a few years will be doing its part toward controlling the two pests. By natural spread and the planting of colonies this parasite has been distributed over the entire area occupied by the gypsy and brown-tail moths, but any sudden decrease of the pests from the work of this parasite cannot be looked for, as under the best conditions it is only capable of doing its allotted part.

METEORUS VERSICOLOR.

This parasite is very similar in its life history and work to the Apanteles. Its cocoon, usually found hanging from the trees by a fine thread, is torpedo shaped and light brown in color. These cocoons make their appearance somewhat later than the cocoons of Apanteles. It is about as valuable a parasite as the latter and the information given under Apanteles in regard to spread and colonization applies to Meteorus as the two are handled together.

COMPSILURA CONCINNATA.

This parasite, the adult of which is a small gray fly about the same size as the common house fly, attacks both the brown-



Effect of work of Gypsy Moths on young apple trees, near the Trull Hospital, Biddeford.

tail and gypsy moths. It deposits maggots inside the caterpillars of the two pests and these feed there until they become full grown, when they come out and form small, oval, dark brown objects called puparia. These are the resting stage between the maggot and the fly. During the summer a number of broods of this parasite develop and in addition to attacking the two pests mentioned a number of injurious native insects are attacked so that the species is beneficial in a number of different ways.

This parasite was first recovered in Maine from a number of towns in the extreme southern part during the summer of 1913 where it had spread from New Hampshire. That same summer a sufficient number of these parasites were obtained by the force connected with the Maine Parasite Laboratory to plant colonies of five hundred each in the towns of Oxford, Baldwin, Yarmouth, Georgetown, Gardiner, Waldoboro and Portland.

The practice followed in obtaining this parasite for colonization is to collect gypsy moth caterpillars from towns where the parasite is abundant, feed these in specially constructed trays until the parasites emerge and then divide these into lots of five hundred for colonization. Until this year this work was done in Massachusetts as the parasite has been in Maine for such a short time that it had not increased enough to make attempts to get it there, profitable. This year, however, this work was all done in Maine and while fewer parasites than were hoped for were obtained, enough were recovered to plant colonies in the towns of Jay, Oakland and Knox.

Indications point to the fact that where this parasite has been liberated it has become established and is doing good work, but it will be a few years before it becomes abundant enough to do its best. More work will have to be done with it as there is a considerable amount of territory occupied by the gypsy and brown-tail moths where it has not been liberated.

CALOSOMA SYCOPHANTA.

This insect is not, properly speaking, a parasite, belonging to a class of insects known as predaceous or preying insects. Both the young and the adults attack the various stages of the gypsy moth and to a lesser extent the browntail. Where abundant they destroy large numbers of both of these pests. In fact, this insect is one of the best enemies we have of the two pests.

This species was first recovered from Maine in the summer of 1913 when a survey of the southern part of the state showed that it had spread as far north as the northern boundaries of Eliot and York. A survey of additional territory the following summer showed that it had spread to a line formed by the northern boundaries of Lebanon, Lyman and Saco. The same summer adults were collected in Massachusetts and colonized at the rate of one hundred to a colony in Waterboro, Baldwin, Gorham, Portland, Cumberland, Brunswick and Bowdoinham. This year enough adults were collected to colonize Newfield, Parsonsfield, Limerick, Limington, Cornish, Standish, Sebago, Yarmouth, North Yarmouth, Bath, Woolwich and New Gloucester.

The adults, which are large metallic green beetles of about an inch in length, are collected from sections where they are abundant and colonized in new territory at the rate of fifty males and fifty females to each colony. If a town is sufficiently infested with the gypsy moth several colonies may be planted there, provided that these are at least two miles apart.

MONODONTOMERUS AERUS.

This insect is not included in the five parasites.

In the preliminary notes on the enemies of the brown-tail and gypsy moths given above it was mentioned that five of these are at present established in Maine. Monodontomerus has not been included in the five for the reason that the amount of good it does is somewhat questionable. It appears to be the most widely known of any of the enemies of the two pests for it is present in the brown-tail webs in considerable numbers during the winter and will come forth at once if these webs are taken into a warm room. It has spread over the entire area inhabited by the brown-tail but has accomplished very little as a parasite of this species. In connection with this insect there has sprung up a very dangerous practice in this state, viz., placing brown-tail webs which may be cut from the trees, in barrels which have been banded with tanglefoot around the top to prevent the escape of the caterpillars. This scheme was adopted under the impression that Monodontomerus was a very beneficial insect which ought to be saved. This insect is not effective enough to warrant this procedure and the danger connected with the practice lies in the fact that such receptacles are very often neglected until they became warped by the weather sufficiently to allow the caterpillars to escape. The webs should not be handled in this way. They should always be cut from the trees and burned at once. The only way that beneficial parasites can be obtained from them is to place them in specially constructed trays or bins and feed the brown-tail caterpillars which emerge with leaves until the Apanteles parasites come out. This involves considerable labor and cannot be done satisfactorily by a person unfamiliar with the work.

The brief notes given above on the various parasites of the gypsy and brown-tail moths thus far liberated in Maine sum up the situation as it is at present. It is very necessary that the people of Maine get a clear idea of the parasite situation as soon as possible. Neglect of property with the hope that the parasites will do the work which ought to be done by the owners is inexcusable and if damage results from such neglect the person suffering from it can command very little sympathy. In time the parasites will give good accounts of themselves but this will only come about after they are well established and, until this happy day arrives, a policy of marking time will not suffice. The owners of property should cooperate with the town and state authorities in the use of various means of killing the two pests. Property owners will be able to help very greatly and relieve themselves of a great amount of discomfort with a small expenditure of time and money if they will only take pains to cut all of the brown-tail webs from their shade and orchard trees and burn them at once. They should endeavor to keep in touch with the situation through the Maine Department of Agriculture and adopt such means of control as may be recommended and finally they should not expect too much of the parasites.

JOHN N. SUMMERS,

Scientific Assistant, U. S. Bureau of Entomology.

REPORT OF DEPUTY STATE SEALER OF WEIGHTS AND MEASURES.

To the Hon. William T. Guptill, Commissioner of Agriculture:

I beg to submit to you my annual report of the Bureau of Weights and Measures.

In assuming the office of Deputy State Sealer of Weights and Measures, April 5, 1915, I found that a very vigorous campaign had been made throughout the state with a view to establishing standards in compliance with Section 2 of Chapter 44 of the Revised Statutes, and nearly every town of the state, either by itself or by combining with other towns, is supplied with a set of standards of the most approved type.

AIM AND CONDUCT OF WORK.

We have endeavored in our work to get in touch with the purchaser and seller, to inquire into the irregularities under the law governing this bureau, and have endeavored to protect the consumer and business interests by giving to all a square deal. It has been our aim to explain the work and answer questions relating to weights and measures. We have endeavored to follow up complaints and have invited the public to call on the department for such investigation.

Realizing the importance of the work in our state, we have endeavored to be conscientious and have given our protection to the honest dealer and the purchasing public. The reports of the local sealers show that they have met some dealers who have opposed any inspection of their scales and measuring devices, and particularly an investigation of their methods of using the same. The reasons have been found to be very plain.

The law of weights and measures has been on our Statutes as long as the territory has been a state, but, like many other laws, has been allowed to pass along without any attempt at enforcement. Our people had forgotten that there was such a

Exhibit of Bureau of Weights and Measures at the Exposition in Portland, June, 1915.

law in existence, and from the records found in this office, I am satisfied that it was only by the most persistent and strenuous work by those formerly holding this position that the work of establishing standards in our several towns was accomplished.

Many complaints have come to this office of short weights in produce, all of which have been adjusted in a manner satisfactory to all interested

Some town officials, as well as some of our merchants, claim that the law is unnecessary. When such a condition exists the work of the local sealer is anything but pleasant. Many complaints of that condition have come to this bureau and we have been obliged to make personal inspection in those cases. Many of the appointing powers fail to realize the importance of this work, and appoint men who are totally unfit for the position and in those cases the work has been very unsatisfactory. In other instances where competent men are appointed the pay received by them for the services rendered is fixed at such a basis that the sealer soon realizes that he cannot do the work for the amount received and do it as it should be done, and only works at it as a side line.

Under the present fee system, one of the most difficult problems is to get competent men to act as sealers. One of the best reasons why the fee system should be abandoned and the work by the local sealers done on a salary basis is that the many forms of trickery and fraud practiced today renders it necessary that the sealer of weights and measures should be on guard at all times to detect the latest schemes. One doing the work of the local sealer should also be an inspector, which work cannot be done under the fee system. He should make at least one visit through his territory as an inspector during the year after his regular trip of testing and sealing.

In the month of April a convention of local sealers was held at the State House at which there were present fifty local sealers, coming from different towns in the state. This meeting had been called by my predecessor and I was not informed of the meeting until a few days before it was to convene. I found that the speakers connected with the Bureau of Standards at Washington, New York and Massachusetts, who had been invited to attend and had expressed their willingness to attend, had been notified that the meeting had been called off and I found myself at that time up against a most perplexing proposition of the year, however, through the courtesy of J. C. Connors of the W. & L. E. Gurley Co. of Troy, N. Y., D. C. Palmer of Detroit, Mich., H. S. Dame and A. E. Scown, both of Boston, we were enabled to explain to the local sealers assembled with us the proper use of scales, the faults, the adjustment, and many other points which were of much interest and benefit to the local sealers. At that convention the State Sealers Association, which was organized in 1914, was given new life by the election of new officers and the following resolutions were adopted:

Resolved, That this association endorse the bill presented in Congress empowering the National Bureau of Standards to regulate the type of weighing and measuring instruments, and be it also

Resolved, That the tolerance and specifications as adopted by the National Conference on Weights and Measures be recommended for adoption in the State of Maine, and

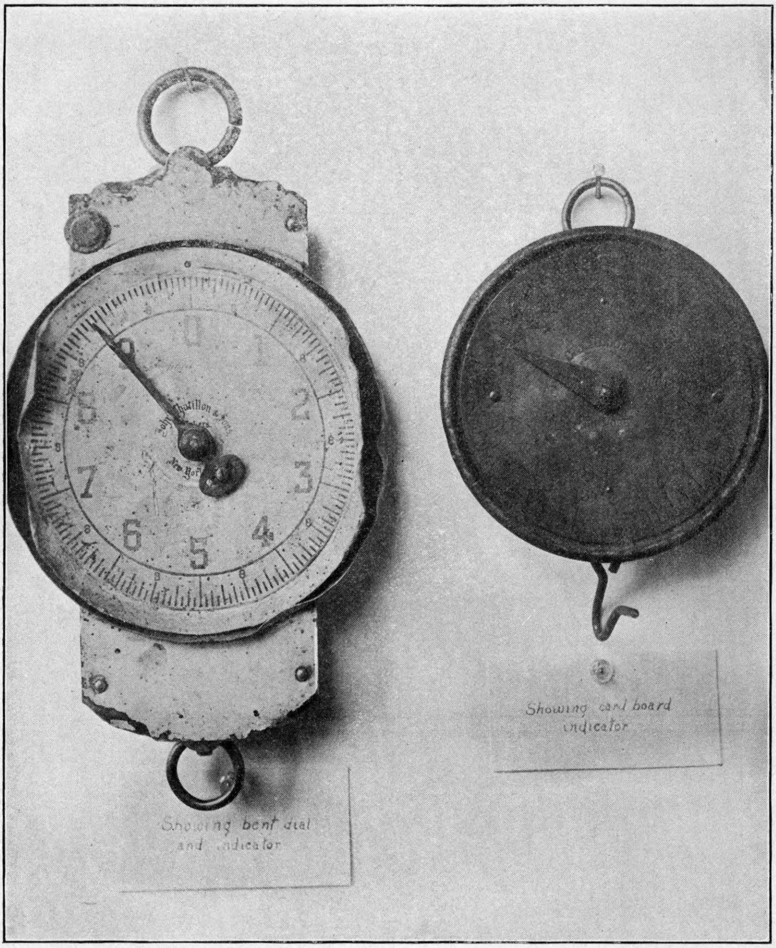
Resolved, That this association record itself as being in favor of the sealers being put under Civil Service.

Committee on Resolutions,

JOHN W. GILMORE.
CHARLES A. WEBSTER.
A. A. WALTON.
H. J. HOVEY.
J. H. MURRAY.

In the month of June, the Agricultural Department was invited to make an exhibit at the Exposition held in Portland, at which time the bureau of weights and measures was represented and, with such devices as it could command, endeavored to show the purchasing public the many ways that the weighing and measuring devices had been made to defraud. For the work done there we have received letters from many, offering their hearty support in behalf of weight and measure inspection. In this report will be found a photograph of the exhibit shown at the Exposition in Portland from June 7 to June 19.

Until the past season it has been possible to sell produce in most any sized box, and the consumer never knew whether he



These scales were in actual use in the season of 1915 and taken by the Bureau of Weights and Measures.

was getting full measure or less. Quite early in the season we received complaints that the produce bought in boxes in certain instances did not hold the number of pounds for which they paid. This question was taken up with the produce dealers with a view of correcting the error which had been in existence for some time in our state. The campaign against short boxes is sure to be quite trying and to eliminate entirely from our state would require much labor and expense.

An investigation of that condition shows that produce would be shipped from other states in short boxes and dealers here would sell it as they bought it. As far as our means would allow, the bureau of weights and measures has done what it could to protect the public and to see that the people receive what they pay for.

Many dealers in this state have notified foreign shippers that produce shipped to them in boxes must comply with our law and that no short boxes would be received. I feel safe in saying that the use of short boxes has been greatly reduced by the refusal of our wholesale dealers to receive them.

Owing to the fact that no appropriation has been available to carry on the work of this bureau, I have been obliged to neglect a large part of the work which should have been done. Complaints came to us in early fall by producers of corn for canning purposes that the weighing devices used in these canning industries in very many cases had not been inspected and sealed. There are one hundred and fifteen of these shops and we were able to visit but twelve of them. The appearance of a state sealer or inspector of weights and measures was to them a great surprise. Of the twelve shops visited, five of them had taken the precaution to have their scales tested. Many of the large platform scales at those shops were set in such a manner that even a mild gust of wind would effect the sensibility of the scale. A little suggestion on behalf of your deputy that they be protected will, I think, bring good results along that line. The work of inspecting the corn canning shops should be carried on another season.

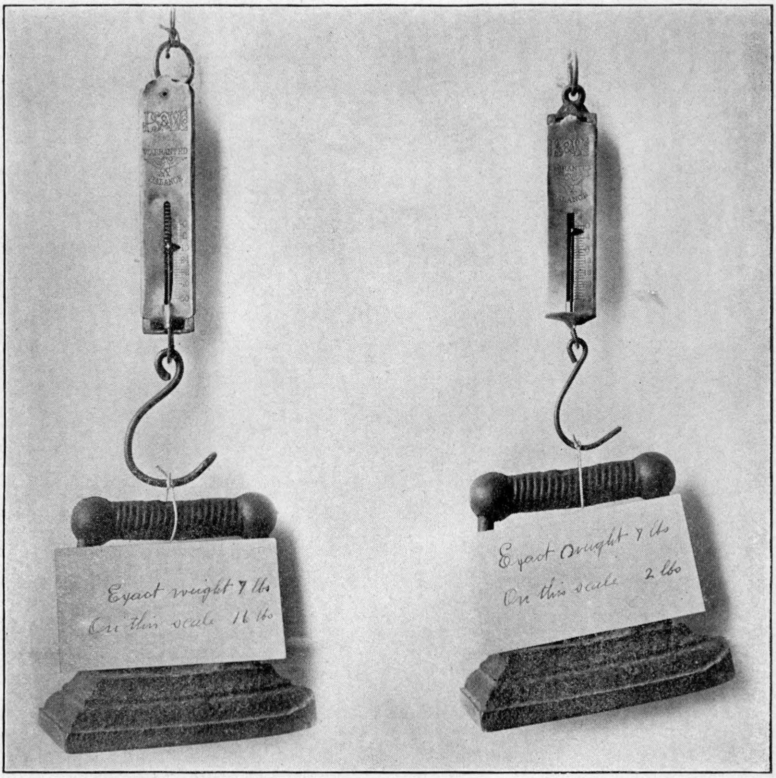
In the past season I visited two hundred and twenty-seven towns and cities for the purpose of inspection. A large number of these visits have been made at the request of merchants. I have visited the following state institutions for the purpose of inspecting weighing and measuring devices. The conditions found in some of them may explain the high cost of maintenance.

The State Hospital at Bangor.
The University of Maine at Orono.
The State Prison at Thomaston.
Central Maine Sanatorium at Fairfield.
State School for Girls at Hallowell.
Western State Sanatorium at Hebron.
Maine School for the Deaf at Portland.
State School for Boys at South Portland.
Maine School for Feeble Minded at Pownal.
Military & Naval Orphan Asylum at Bath.
The State Hospital at Augusta.

The State Hospital at Bangor has four sets of scales, running from a small counter scale to the outdoor or platform scale. One set of scales, owing to careless handling by one of the patients at the institution, was temporarily put out of commission. An expert scale man was called in and the defect corrected, so that the scales in that institution were all tested and sealed. They use the system of checking all produce and coal furnished the institution and used by them.

At the University of Maine we found seven sets of scales. Four of these were at the Experiment Station and were tested and found correct. The scales used in the dairy department were found considerably out of balance and I was unable to get from the man in attendance that any considerable attention was given to the scales and so long as they showed approximately the amount of milk and other products of the dairy they were accepted as satisfactory by them. In the barn the scales which I assume were used to weigh the feed for the cattle I found balanced up with chips of wood. I also found that in the dairy department they were using as a measure for their milk an unsealed fibre container. I was informed by the party in charge that the milk sold to their customers was measured in that container.

At the State Prison, in Thomaston, I found four sets of scales and, notwithstanding that I expected to find a deplorable condition existing in their weighing devices, I am frank to say that the four sets were found to be in excellent condition and



Showing how people are cheated by sliding face scales.

received as much care and attention by those in charge as any furniture in the institution. All goods received and all goods consumed are checked over these scales.

At the Central Maine Sanatorium, in Fairfield, I found but two sets of scales, one being a set of Jones scales used for hospital purposes and a small set of family scales used in the store to check up goods used in the kitchen. The type of scales used there is of the same type that is generally condemned. I find no system of checking goods received at that institution.

At the State School for Girls, in Hallowell, I found four sets of scales which, had they been used in any store in Maine, unless by accident they had escaped sight of the local sealer, would have been condemned. The platform scales passed inspection as did the brass faced spring balances used in the barn for the purpose of weighing the milk, and one small scoop scale. They have no facilities whatever for weighing or checking up their coal.

At the Western Maine Sanatorium, in Hebron, I found the scales used in weighing drugs to be absolutely useless so far as weighing drugs is concerned and not in any way satisfactory to the parties obliged to use them. Another set of equal arm scoop scales used for checking up small goods as was the set of spring scales in the barn, worthless. A test which was given the heavy hay scales over which they were checking coal at my visit, were found to be all right, as were the platform scales used in reweighing and checking their groceries.

The Maine School for the Deaf, in Portland, had one set of family scales of the capacity of twenty pounds, condition fair, but unfit, for the purpose of checking up goods bought for use in the institution.

The Maine School for Feeble Minded, in Pownal, had four sets of scales: A small set of counter scales found to be all right and a set of platform scales used in the grain-room were all right; a set of scales used in the store were old and much corroded, much out of balance and worthless. An effort is being made by this institution to keep close tabs on everything purchased for the institution, which they are unable to do with any degree of accuracy with the weighing devices they now have.

The Military & Naval Orphan Asylum, in Bath, has no means of weighing or checking up goods bought, excepting a small brass face spring balance, capacity ten pounds. No checking system is used.

A visit to the State School for Boys, in South Portland, disclosed a set of platform scales used in the store for checking up goods received, were balanced with the knives taken from a meat cutter, and with nails fastened with a string to the balance ball and hung down the post leading from the platform to the beam. The value of that manner of balancing scales is somewhat fictitious. An experiment of those conditions has resulted in the conclusion that scales balanced with articles hung on the balance ball back of the ball has a tendency to in-increase the weight of the article on the platform after it has reached a certain number of pounds. A small set of scoop scales also used in the store were found to be considerably out of balance, but might possibly be made to do service for some time after being overhauled by an expert scale man. The platform scales in the engineer's room were found to be in prime condition. Excellent care is taken of them and if injured at all for some years to come will be caused by the desire of those in attendance to keep them clean by constant rubbing of the beam.

At the Augusta State Hospital a large set of platform scales was found to be, on a draft of five hundred pounds, out four pounds. The track scales used for checking their coal in the boiler room were found in a worse condition than the scales used in buying produce for the kitchen supply. A car of coal was run upon the track and, after taking the weight of the coal, two heavy men were put on the car with the coal and the scales balanced the same, thus showing that the scales would balance at any point you cared to make them. The meat scales were found to be all right. Two sets of counter scoop and platform scales and one set of small platform scales were found to be correct.

We have been called upon to make inspections and tests on outdoor platform scales in several places throughout the state. The testing of these large scales involves the carrying of at least five hundred pounds of standard weight. To take those weights from this office would necessarily require much time and expense, consequently we have not been able to comply with those requests, excepting in towns where those heavy test weights could be obtained from the local sealer.

The results and importance of the enforcement of the weights and measures law can be easily shown by taking these figures into consideration:

A manufacturer of butter sells the same at thirty-five cents per pound and on the average of 5.10 per cent short weight on the sale of one ton per month makes $17.85 illegal profit; if his output is the same each month of the year his annual illegal profit is $428.40. If, out of the fifty-five creameries in the state of Maine, fifteen per cent of them sell cream by weight at the average price of $1.28 per gallon at a shortage of weight equivalent to two cents per gallon, the daily output amounting to one hundred gallons would show an illegal profit of $576 to one plant alone.

The butcher, including as meat sold at the extremely low price of twenty cents per pound, on the average of one ounce of paper and string per pound, on sales of 250 pounds per day, gets an illegal profit per year of over $1,100. Many other examples could be given, showing a similar situation in almost all lines of trade.

MANUFACTURERS OF MILK BOTTLES AND MILK CONTAINERS WHO HAVE FILED BONDS.

The following manufacturers of milk bottles and milk containers have filed bonds with the State Treasurer in compliance with Section 1 of Chapter 81 of the Public Laws of 1913, relating to the sealing of milk bottles and jars, as amended by Chapter 44 of the Public Laws of 1915, and the following designating numbers assigned:

The Thatcher Manufacturing Co., Elmira, N. Y.
Maine Seal No. 1.

Poughkeepsie Glass Works, Poughkeepsie, N. Y.
Maine Seal P-3.

Travis Glass Co., Clarksburg, W. Va.
Maine Seal T-19.

Essex Glass Co., Mt. Vernon, Ohio.
Maine Seal E-4.

Fidelity Glass Co., Tarentum. Pa.
Maine Seal F-2.

Weis Manufacturing Co., Monroe, Mich.
Maine Seal E-5.

Wisconsin Fibre Bottle Co., Milwaukee, Wis.
Maine Seal W. F. B. Co.-W .019.

The newspapers of the state have contributed materially to whatever we have achieved and I feel indebted to them for their valuable space. To them can be traced the enlightened attitude of the public today.

The work of this bureau intimately concerns the public in many ways and the newspapers have been quick to grasp this fact. The past courtesies are appreciated and the wish is here expressed that they will deal generously with us in the future.

I wish to express my thanks to the sealers throughout the state for their courteous treatment accorded me throughout the year and for their efficient effort to perform their duties as the law directs.

In closing, permit me to record my deep appreciation of the consideration shown me by yourself and to express the hope that my duties have been performed in a manner to merit the confidence imposed in me.

Respectfully submitted,

EDGAR A. RUSS,

Deputy State Sealer of Weights and Measures.

REPORT FROM TWO HUNDRED EIGHTY-SIX TOWNS AND CITIES.

Name of Town.	Number Tested.								Number Condemned.							Automatic pumps adjusted.	Weights adjusted.	Scales adjusted.	Tested.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.	Milk cans.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.				
Androscoggin County.																			
Auburn	427	1,047	22	47	-	21	149	-	5	8	-	4	-	1	5	-	-	-	
East Livermore	80	118	4	25	4	9	-	-	-	-	-	-	-	-	-	-	-	-	
Lewiston	288	66	19	109	11	-	214	-	17	3	-	2	1	-	8	-	-	-	
Mechanic Falls	56	1	2	18	13	8	-	-	1	-	-	-	-	-	-	-	-	-	
Minot	12	20	4	8	3	4	-	-	-	-	-	-	-	-	-	-	-	-	
Webster	26	43	8	20	4	3	-	-	-	-	-	-	-	-	-	-	-	-	
Greene	18	21	-	10	3	3	-	-	-	-	-	-	-	-	-	-	-	-	
Leeds	26	54	7	21	3	5	-	-	-	-	-	2	-	-	-	-	-	-	
Total	933	1,370	66	258	41	53	363	-	23	11	-	8	1	1	13	-	-	-	
Aroostook County.																			
Blaine	21	63	-	1	1	4	-	-	-	-	-	-	-	-	-	-	-	-	
Caribou	81	115	-	39	4	22	-	-	-	-	-	-	-	-	-	-	-	-	
Fort Kent, Frenchville, Wallagrass	131	190	-	57	25	25	-	-	19	10	-	12	-	3	-	-	-	-	
Houlton	125	300	14	122	-	20	1,192	-	-	4	5	9	-	2	12	-	-	-	
Island Falls	39	82	-	17	11	13	76	-	1	-	-	-	-	-	-	-	-	-	
Linneus	7	3	1	6	-	3	-	-	-	-	-	-	-	-	-	-	-	-	
Littleton	18	6	-	9	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ludlow	2	-	1	6	-	2	-	-	-	-	-	-	-	-	-	-	-	-	
Madawaska, Grand Isle and St. Agatha	79	220	-	22	12	38	-	-	-	-	-	-	1	-	-	-	-	-	
Mars Hill	54	162	8	7	8	8	-	-	-	-	-	-	-	-	-	-	-	-	
Monticello	44	12	4	24	3	5	-	-	-	-	-	-	-	-	-	-	-	-	
New Limerick	8	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	
New Sweden	31	-	-	22	2	5	-	-	-	-	-	-	-	-	-	-	-	-	
Stockholm	26	-	-	12	3	2	-	-	-	-	-	-	-	-	-	-	-	-	
Westfield	22	66	-	3	1	3	-	-	-	-	-	-	-	-	-	-	-	-	
Winterville	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Dyer Brook	30	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	
Total	720	1,219	28	348	71	152	1,269	-	22	14	5	21	1	5	12	-	-	-	

REPORT FROM TWO HUNDRED EIGHTY-SIX TOWNS AND CITIES—Continued.

Name of Town.	Number Tested.								Number Condemned.							Automatic pumps adjusted.	Weights adjusted.	Scales adjusted.	Tested.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.	Milk cans.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.				
Cumberland County.																			
Bridgton	12	20	–	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Brunswick	137	52	45	50	65	3	30	–	1	–	–	–	–	–	–	–	–	–	
Cape Elizabeth	14	52	9	11	–	3	–	–	–	–	–	–	–	–	–	–	–	–	
Casco	19	–	–	5	1	1	–	–	–	–	–	–	–	–	–	–	–	–	
Cumberland	27	17	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	
Falmouth	19	25	16	4	–	5	–	–	3	–	2	–	–	–	–	–	–	–	
Freeport	44	15	10	10	9	11	600	–	1	–	–	–	–	–	–	–	–	–	
Gray	54	89	–	40	5	10	–	–	3	–	–	–	1	6	–	–	–	6	40 coal baskets.
Harpswell	46	–	–	40	3	7	–	–	1	–	–	–	–	–	–	–	–	–	
Naples	21	–	12	11	5	2	–	–	–	–	–	–	–	–	–	–	–	–	
New Gloucester	41	74	5	39	5	13	–	–	2	–	1	–	–	6	–	–	–	–	
Portland	1,351	2,158	84	37	–	14	–	1225	61	32	12	14	–	–	–	–	–	–	160 oil cans.
Pownal	11	26	–	16	4	6	–	–	–	–	–	–	–	–	–	–	–	–	
Scarborough	36	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	
Sebago	12	35	8	11	–	3	–	–	–	–	–	–	–	–	–	–	–	–	
South Portland	84	336	–	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Standish	51	121	29	22	5	12	–	–	–	–	1	3	–	–	–	–	–	–	
Westbrook	113	217	12	18	9	12	324	24	1	4	–	–	–	–	–	–	–	–	
Total	2,092	3,237	230	344	111	103	964	1,249	75	36	16	17	1	12	–	–	–	6	
Franklin County.																			
Eustis	21	5	–	6	3	10	–	–	1	–	–	–	–	–	–	–	–	–	
Industry	8	31	–	4	2	1	–	–	–	2	–	–	–	1	–	–	–	–	
Jay	50	33	–	11	2	–	–	–	–	–	–	–	–	–	–	–	–	–	
Kingfield	19	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	
Madrid, Phillips	33	132	4	10	12	8	190	–	–	–	–	–	–	–	2	–	–	–	
New Sharon	22	–	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Weld	14	35	–	6	2	–	–	–	–	–	–	–	–	–	–	–	–	–	
Wilton	72	216	3	17	2	17	650	–	1	–	–	–	–	–	–	–	–	–	
Rangeley	35	10	2	2	3	6	6	–	–	–	–	–	–	–	–	–	–	–	
Total	274	462	14	56	26	43	846	–	2	2	–	–	–	1	2	–	–	–	

Hancock County.																			
Amherst	16	30	5	30	14	3	-	-	2	1	-	-	-	-	-	-	-	-	
Bluehill	21	5	12	10	3	6	-	-	-	-	-	-	-	-	-	-	-	-	
Cranberry Isles	18	45	5	15	3	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ellsworth, Surry, Otis, Trenton	144	304	57	148	37	34	-	-	1	-	1	2	-	-	-	-	-	-	
Gouldsboro	45	110	32	45	6	5	-	-	1	-	-	-	-	2	-	-	-	-	
Long Island Pl	4	9	-	5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	
Mount Desert	73	116	20	33	10	11	-	-	-	-	-	-	-	-	-	-	-	-	
Orland	18	-	10	20	5	-	1	-	1	-	-	-	-	-	-	-	-	-	
Sedgwick	73	-	35	62	8	9	136	-	13	-	2	9	3	-	-	-	-	-	
Stonington	26	22	17	43	5	13	-	-	-	-	-	8	-	1	-	-	-	-	
Swans Island	16	14	15	21	4	1	-	-	1	-	-	-	-	-	-	-	-	-	
Tremont	34	-	-	17	7	5	-	-	1	-	-	-	-	-	-	-	-	-	
Winter Harbor	19	40	-	30	2	1	96	-	-	-	-	-	-	-	-	-	-	-	40 coal baskets.
Bucksport	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Eden	110	-	8	60	-	29	-	-	1	-	-	-	-	-	-	-	-	-	
Sorrento	7	-	2	-	-	-	225	-	1	-	-	-	-	-	13	-	-	-	
Southwest Harbor	15	-	20	30	15	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	639	695	238	571	119	122	458	-	22	1	3	19	3	3	13	-	-	-	
Kennebec County.																			
Albion	7	19	2	15	-	6	-	-	-	-	-	-	-	-	-	-	-	-	
Augusta	260	544	33	36	64	24	-	-	-	4	5	8	11	-	-	-	-	-	
Belgrade, Sidney	46	-	13	44	1	11	-	-	-	-	-	-	-	-	-	-	-	-	
Chelsea	6	15	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
China	43	111	2	30	4	13	-	-	-	-	-	-	-	-	-	-	-	-	
Gardiner, So., W. Gardiner	11	8	-	29	-	3	143	-	1	-	-	5	-	1	-	-	-	-	
Hallowell	54	134	-	20	9	20	-	-	-	-	-	4	-	-	-	-	-	-	
Litchfield	21	30	-	6	3	8	-	-	-	-	-	-	-	-	-	-	-	-	
Oakland	19	52	9	38	4	11	375	-	2	-	-	-	-	-	-	-	-	-	
Pittston	17	-	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Randolph	25	45	20	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Vassalboro	49	182	2	40	6	11	-	-	1	-	-	3	-	-	-	-	-	-	
Vienna	13	50	1	19	6	3	-	-	-	-	-	-	-	-	-	-	-	-	
Waterville	144	323	8	39	-	8	5	-	6	-	2	7	-	1	4	-	-	-	
Windsor	6	45	1	18	-	3	-	-	-	-	-	-	-	-	-	-	-	-	
Winslow	38	69	19	41	-	6	-	-	-	-	-	-	-	-	-	-	-	-	
Winthrop	30	22	-	6	9	4	-	-	-	-	-	-	-	-	-	-	-	-	
Wayne	11	26	-	3	5	6	-	-	-	-	-	-	-	-	-	-	-	-	
Fayette	5	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Monmouth	55	87	-	54	5	5	-	-	1	-	-	1	-	-	-	-	-	-	
Mount Vernon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Readfield	31	51	-	24	4	1	-	-	-	-	-	-	-	-	-	-	-	-	
Total	891	1,826	114	472	120	147	523	-	11	4	7	28	11	2	4	-	-	-	

REPORT FROM TWO HUNDRED EIGHTY-SIX TOWNS AND CITIES—Continued.

Name of Town.	Number Tested.								Number Condemned.							Automatic pumps adjusted.	Weights adjusted.	Scales adjusted.	Tested.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.	Milk cans.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.				
Knox County.																			
Appleton	15	22	4	5	2	12	-	-	1	3	1	-	1	-	-	-	-	-	
Rockland	284	355	88	109	-	26	138	-	-	-	-	-	-	-	-	-	-	-	
Union	20	58	-	1	8	7	-	-	-	-	-	-	-	-	-	-	-	-	
Vinalhaven	56	169	40	39	2	11	360	-	2	-	3	3	-	-	-	-	-	-	
Washington	23	79	2	11	7	1	-	-	1	-	-	-	-	-	-	-	-	-	
Thomaston	37	105	35	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	435	788	169	213	19	57	498	-	4	3	4	3	1	-	-	-	-	-	
Lincoln County.																			
Bristol	84	126	44	69	10	7	-	-	7	7	-	4	7	2	-	-	-	-	
Dresden	25	68	2	15	3	7	-	-	-	-	-	-	-	-	-	-	-	-	
Somerville	7	21	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	
Westport	14	31	13	16	-	-	-	-	5	-	-	2	-	-	-	-	-	-	
Whitefield	16	-	-	6	-	3	-	-	-	-	-	-	-	-	-	-	-	-	
Boothbay	27	58	8	4	-	3	-	-	-	-	-	-	-	-	-	-	-	-	
Boothbay Harbor	51	140	4	6	-	4	-	-	1	9	-	-	-	-	-	-	-	-	
Edgecomb	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Southport	12	22	8	6	-	1	-	-	-	1	-	-	-	-	-	-	-	-	
Total	252	486	79	125	13	26	-	-	13	17	-	6	7	2	-	-	-	-	
Oxford County.																			
Andover	33	8	-	8	-	9	-	-	-	-	-	-	-	-	-	-	-	-	
Bethel	29	58	6	8	3	12	618	-	6	2	-	2	-	-	63	-	-	-	
Buckfield	30	64	4	11	2	6	-	-	-	-	1	-	-	-	-	-	-	3	3 gauges.
				Gr'd 6															
Gilead	8	14	3	3	1	3	-	-	1	-	3	2	-	-	-	-	-	-	
Hanover	10	23	1	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-	

Hartford	8	-	-	4	-	-	-	-	3	-	-	1	-	-	-	-	-	-		
Hebron	14	-	1	3	1	3	-	-	-	-	1	1	-	1	-	-	-	-		
Hiram	39	5	7	5	4	7	-	-	-	-	-	-	-	-	-	-	-	-		
Newry	9	24	-	6	1	2	-	-	1	-	-	-	-	-	-	-	-	-		
Norway	79	-	6	17	1	7	159	-	1	-	-	-	-	-	-	-	-	-		
Peru	13	28	-	2	2	12	-	-	1	-	-	-	1	-	-	-	-	-		
Paris	46	-	1	6	-	9	72	-	-	-	1	-	-	-	-	-	-	-		
Roxbury	5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Stoneham	4	12	1	4	1	2	-	-	1	-	-	-	1	-	-	-	-	.		
Stow	4	12	-	3	1	1	-	-	-	-	.	-	1	-	-	-	-	-		
Waterford	26	7	-	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-		
Woodstock	25	75	10	8	4	3	-	-	-	-	-	-	-	-	-	-	-	-		
Brownfield	41	103	14	38	3	9	-	-	-	-	-	-	2	-	-	-	-	-		
Byron	4	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Denmark	15	22	1	7	2	5	-	-	1	-	-	-	2	-	-	-	-	-		
Total	442	455	59	149	30	93	849	-	15	2	6	6	7	1	63	-	-	3		
Penobscot County.																				
Bangor	666	1,332	292	370	117	58	2,028	-	11	6	61	14	19	-	43	-	-	-	582 ice cream cans.	
Bradley	12	31	6	2	3	4	47	-	-	-	-	-	-	-	-	-	-	-		
Burlington	4	13	-	4	2	3	-	-	-	-	-	1	-	-	-	-	-	.		
Dexter	29	87	-	4	-	2	73	-	2	-	-	-	-	-	4	-	-	-		
Eddington, Holden, Orrington, Clifton, Dedham	56	112	1	60	6	3	1	-	12	-	1	3	-	-	-	-	-	-		
Enfield	24	72	15	41	12	14	-	-	1	-	-	-	-	-	-	-	-	-		
Glenburn	6	15	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1	1 coal basket.	
Howland	9	16	3	19	4	4	-	-	1	-	-	-	-	-	-	-	-	-		
Hudson	13	24	5	8	3	2	-	-	-	-	-	-	1	-	-	-	8	1	1 coal basket.	
Kenduskeag	29	81	1	30	10	13	36	-	-	-	-	-	2	-	-	2	-	6		
Kingman, Prentiss, Springfield, Carroll, Macwahoc Pl.	50	172	6	35	28	4	-	-	4	-	-	1	1	-	-	-	-	-		
LaGrange	18	50	8	16	4	9	-	-	-	-	-	-	-	-	-	-	-	-		
Lee	12	8	5	9	-	3	-	-	-	-	-	-	-	-	-	-	-	-		
Levant	9	20	-	13	5	3	-	-	-	-	-	-	-	-	-	-	5	-		
Lowell	4	14	-	9	2	2	-	-	-	-	-	-	-	-	-	-	-	-		
Old Town, Orono, Argyle	174	294	74	83	-	29	258	-	4	-	-	1	-	-	11	-	294	-		
Passadumkeag	8	14	12	8	5	4	-	-	-	-	-	-	-	-	-	-	-	-		
Seboeis Pl.	4	14	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-		
Charleston	67	270	7	16	17	14	-	-	1	2	-	-	-	-	-	-	-	-		
Corinna	10	30	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-		
Patten	37	90	20	24	4	9	-	-	-	-	-	-	4	-	-	-	-	-		
Total	1,241	2,798	456	755	224	183	2,443	-	36	12	62	20	27	-	58	2	307	8		

REPORT FROM TWO HUNDRED EIGHTY-SIX TOWNS AND CITIES—Continued.

Name of Town.	Number Tested.								Number Condemned.							Automatic pumps adjusted.	Weights adjusted.	Scales adjusted.	Tested.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.	Milk cans.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.				
Piscataquis County.																			
Atkinson	8	-	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	
Greenville	49	108	16	32	9	16	-	-	-	-	1	3	1	-	-	-	-	-	
Monson	36	63	5	8	7	15	-	-	-	-	-	-	-	-	-	-	-	-	
Parkman	13	-	-	13	-	-	46	-	1	-	-	-	-	-	11	-	-	-	
Willimantic	6	18	1	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	
Abbott	16	48	-	10	2	2	-	-	-	-	-	-	-	-	-	-	-	-	
Blanchard	6	25	-	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	
Foxcroft	57	101	-	-	-	9	-	-	1	1	-	-	-	-	-	-	-	-	
Total	191	363	22	69	22	45	46	-	2	1	1	3	1	-	11	-	-	-	
Sagadahoc County.																			
Arrowsic	5	-	7	9	-	-	40	-	1	-	-	1	-	-	-	-	-	-	
Bath	453	815	103	201	12	11	583	36	13	41	11	13	1	-	21	-	118	-	
Bowdoin	9	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Bowdoinham	32	76	-	13	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
Georgetown	31	71	16	40	1	2	-	-	-	-	3	1	-	-	-	-	-	-	
Phippsburg	6	23	11	19	-	-	79	13	-	-	2	3	-	-	11	-	-	-	
Richmond	75	196	26	83	-	-	156	-	1	-	-	-	-	-	-	-	-	-	
Topsham	21	15	8	7	-		10	-	-		-	-	-	-		-	-	-	
West Bath	9	5	21	15	-	-	327	32	2	-	3	2	-	-	7	-	-	-	
Woolwich	25	213	15	23	-	1	42	13	3	4	-	3	-	-	-	-	-	-	
Total	666	1,432	207	400	14	14	1,237	94	20	45	19	23	1	-	39	-	118	-	

Somerset County.																		
Anson	43	116	-	11	6	7	7	-	2	1	.	1	-	1	-	-	-	-
Bingham	31	-	2	6	4	11	220	-	-	-	-	-	-	-	-	-	-	-
Cambridge	7	18	-	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Caratunk Pl.	6	-	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Concord	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Madison	76	158	2	38	31	8	3	-	3	3	-	8	2	-	-	-	-	-
Mercer, Norridgewock	72	116	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-
Moscow	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pittsfield	44	56	11	19	-	3	-	-	2	-	-	-		-	-	-	-	
Skowhegan	158	51	14	16	6	14	-	-	12	3	2	-	-	-	-		-	-
Solon	32	96	-	4	3	12	350	-	-	-	-	-	-	-	-	-	-	-
St. Albans	23	76	-	10	-	3	50	-	-	-	-	-	-	-	-	-	-	-
Starks	8	17	-	-	1	-	-	-	-	21	-	-	-	-	-	-	-	-
The Forks	5	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-
Dennistown	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jackman	4	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	518	712	29	111	61	63	630	-	19	28	2	9	2	1	0	0	0	0
Waldo County.																		
Belfast	176	464	46	122	25	28	400	-	10	14	8	12	13	1	6	-	-	-
Burnham	18	-	-	20	-	6	-	-	-	-	-	-	-	-	-	-	-	-
Islesboro	20	47	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Jackson	8	27	1	6	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Liberty	12	14	-	5	2	4	-	-	-	-	-	-	-	1	-	-	-	-
Lincolnville	17	45	10	6	1	3	-	-	1	5	1	-	1	-	-	-	-	-
Monroe	11	31	-	4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
Montville	5	11	-	-	2	4	-	-	-	-	-	-	-		-	-	-	-
Palermo	6	18	-	4	1	4	-	-	-	-	-	-	-	-	-	-	-	-
Searsmont	14	27	-	7	2	8	-	-	-	-	-	-	-	-	-	-	-	-
Searsport	48	-	14	13	2	5	-	-	-	-	-	-	-	-	-	-	-	-
Unity, Thorndike, Freedom, Unity Pl.	68	-	-	-	-	22	-	-	-	-	-	-	-	-	-	-	-	-
Winterport	40	8	108	35	5	6	18	-	-	2	-	-	-	-	-	-	-	-
Total	443	692	181	226	48	94	418	-	11	21	9	12	14	2	6	-	-	-

REPORT FROM TWO HUNDRED EIGHTY-SIX TOWNS AND CITIES—Concluded.

Name of Town.	Number Tested.								Number Condemned.							Automatic pumps adjusted.	Weights adjusted.	Scales adjusted.	Tested.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.	Milk cans.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.				
Washington County.																			
Addison, Columbia, Columbia Falls, Harrington	73	194	79	132	26	24	–	–	–	–	–	–	–	–	–	–	–	–	
Baring	5	–	2	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Calais	141	34	16	21	–	21	–	–	–	–	–	–	–	1	–	–	–	–	
Cooper	5	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Cutler	9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Dennysville	10	6	9	15	2	3	–	–	–	–	–	–	–	–	–	–	–	–	
Edmunds	1	2	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Jonesboro	16	12	3	6	2	1	–	–	–	–	–	–	2	–	–	–	–	–	
Machias	81	10	8	14	2	1	2	–	–	–	–	–	–	–	–	–	–	–	
Machiasport	18	12	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	
Marion	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Marshfield	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Meddybemps	5	–	–	7	–	–	–	–	2	–	–	–	–	–	–	–	–	–	
Milbridge	20	15	8	9	7	8	–	–	–	–	–	–	–	–	–	–	–	–	
Northfield	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Pembroke	21	16	27	24	2	9	–	–	–	–	–	–	–	–	–	–	–	–	
Perry	35	56	34	28	2	7	–	–	5	–	2	1	2	3	–	–	–	–	
Robbinston	16	–	–	9	3	2	–	–	3	–	–	–	–	–	–	–	–	–	
Topsfield	22	–	–	–	3	–	–	–	1	–	–	–	–	–	–	–	–	–	
					Metric														
					2														
Vanceboro	12	15	13	12	5	2	–	–	–	–	–	–	–	–	–	–	–	–	
Wesley	6	2	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Whitneyville	3	–	5	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Beddington	1	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Cherryfield	35	50	4	10	4	2	–	–	–	–	–	–	–	–	–	–	–	–	
Princeton	21	13	–	14	4	3	–	–	–	–	–	–	–	–	–	–	–	–	
Total	558	429	214	319	66	83	2	–	11	–	2	1	4	4	–	–	–	–	

York County.																		
Alfred	14	60	5	13	2	5	-	-	1	-	-	-	-	-	-	-	-	-
Biddeford	292	512	141	82	50	7	-	-	-	-	-	-	1	-	-	3	36	37
Buxton	35	54	12	14	4	-	-	-	2	-	-	-	-	-	-	-	-	-
Dayton	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eliot	25	48	5	5	-	13	110	-	2	-	-	-	-	-	-	-	-	-
Hollis	31	57	30	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-
Kittery	39	60	-	11	2	6	36	-	2	-	-	-	-	-	-	-	-	-
Lebanon	20	61	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limerick	21	24	17	29	4	9	29	-	1	-	2	4	-	-	2	-	-	-
Lyman	4	7	5	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
North Berwick	41	13	-	2	2	-	-	-	2	-	-	-	-	-	-	-	-	-
Old Orchard	117	145	49	91	19	14	-	-	12	-	5	1	4	-	-	-	-	-
Saco	165	296	125	140	30	20	600	-	9	25	30	15	5	3	125	-	-	-
Sanford	356	1,697	94	70	8	58	7,347	-	1	-	-	-	-	-	-	-	-	-
Shapleigh	23	64	15	6	2	11	-	-	-	-	-	-	-	-	-	-	-	-
Waterboro	36	60	30	15	12	14	-	-	-	-	-	-	-	-	-	-	-	-
Kennebunk	45	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-
Kennebunkport	20	47	20	5	10	12	-	-	-	-	-	-	-	-	-	-	-	-
Total	1,285	3,205	553	483	149	172	8,122	-	40	25	37	20	10	3	127	3	36	37

The above tables are certainly an accurate indication of what is being done and speak well of the activity among the local sealers. It shows plainly the need that exists for this department.

SUMMARY.

Counties.	Number Tested.								Number Condemned.							Adjusted.			Tested.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Pumps.	Milk jars.	Milk cans.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Pumps.	Milk jars.	Automatic pumps.	Weights.	Scales.	
Androscoggin County	1,040	1,540	85	281	45	67	363	–	28	12	–	9	1	1	13	–	15	10	
Aroostook County	720	1,219	28	348	71	152	1,269	–	22	14	5	21	1	5	12	–	–	–	
Cumberland County	2,092	3,237	230	344	111	103	964	1,249	75	36	16	17	1	12	–	–	–	6	160 oil cans.
Franklin County	274	462	14	56	26	43	846	–	2	2	–	–	–	1	2	–	–	–	
Hancock County	639	695	238	571	119	122	458	–	22	1	3	19	3	3	13	–	–	–	40 coal baskets.
Kennebec County	891	1,826	114	472	120	147	423	–	11	4	7	28	11	2	4	–	–	–	
Knox County	463	908	181	219	21	63	498	–	4	3	4	3	1	–	–	–	–	–	
Lincoln County	350	686	109	143	23	40	20	–	13	17	–	6	7	2	–	–	–	–	
Oxford County	570	644	79	213	46	109	909	–	17	2	6	6	10	1	63	–	–	3	3 gauges.
Penobscot County	1,290	2,836	456	778	236	189	2,443	–	36	12	62	20	27	–	58	2	307	8	2 coal baskets. 582 ice cream cans.
Piscataquis County	243	492	23	105	34	53	246	–	2	1	1	3	3	–	13	–	–	–	
Sagadahoc County	666	1,432	207	400	14	14	1,237	94	20	45	19	23	1	–	39	–	118	–	
Somerset County	574	881	31	132	63	79	630	–	19	35	2	9	2	2	–	–	–	–	
Waldo County	443	692	181	226	48	94	418	–	11	21	9	12	14	2	6	–	–	–	
Washington County	558	429	214	319	66	83	2	–	11	6	2	1	4	4	–	–	–	–	
York County	1,285	3,205	553	483	149	172	8,122	–	40	25	37	20	10	3	127	3	36	37	
	12,098	21,184	2743	5090	1192	1530	18,848	1,343	333	230	173	197	96	38	350	5	476	64	

Tested, 64,028. Condemned, 1,417. Percentage condemned, 2¼%.

SUPPLEMENTARY LIST.

Name of Town.	Number Tested.								Number Condemned.								Adjusted		Tested.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.	Milk cans.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.	Milk cans.	Weights.	Scales.	
Androscoggin County.																			
Lisbon Falls	52	20	4	5	–	3	–	–	2	1	–	1	–	–	–	–	–	–	
Poland	55	150	15	18	3	11	–	–	3	–	–	–	–	–	–	–	15	10	
	107	170	19	23	3	14	–	–	5	1	–	1	–	–	–	–	15	10	
Knox County.																			
Warren	28	120	12	6	2	6	–	–	–	–	–	–	–	–	–	–	–	–	
Lincoln County.																			
Waldoboro	60	200	30	18	8	12	20	–	–	–	–	–	–	–	–	–	–	–	
Wiscasset	38	–	–	–	2	2	–	–	–	–	–	–	–	–	–	–	–	–	
	98	200	30	18	10	14	20	–	–	–	–	–	–	–	–	–	–	–	
Oxford County.																			
Dixfield	17	4	4	2	2	1	48	–	1	–	–	–	–	–	–	–	–	–	
Fryeburg	63	107	9	42	10	10	12	–	–	–	–	–	3	–	–	–	–	–	
Greenwood	12	40	4	2	1	1	–	–	–	–	–	–	–	–	–	–	–	–	
Lincoln Pl	3	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Lovell	12	26	1	13	1	2	–	–	1	–	–	–	–	–	–	–	–	–	
Mexico	19	5	–	3	1	2	–	–	–	–	–	–	–	–	–	–	–	–	
Milton Pl	2	5	2	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	
	128	189	20	64	16	16	60	–	2	–	–	–	3	–	–	–	–	–	

SUPPLEMENTARY LIST—CONCLUDED.

NAME OF TOWN.	NUMBER TESTED.								NUMBER CONDEMNED.								ADJUSTED		TESTED.
	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.	Milk cans.	Scales.	Weights.	Dry measures.	Liquid measures.	Yard sticks.	Automatic pumps.	Milk jars.	Milk cans.	Weights.	Scales.	
Penobscot County.																			
Carmel	6	15	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	
Etna	6	16	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	
Plymouth	6	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Stetson	12	-	-	15	3	4	-	-	-	-	-	-	-	-	-	-	-	1	
Winn	19	7	-	6	2	2	-	-	-	-	-	-	-	-	-	-	-	-	
	49	38	-	23	12	6	-	-	-	-	-	-	-	-	-	-	-	1	
Piscataquis County.																			
Guilford	37	96	-	25	10	6	200	-	-	-	-	-	2	-	2	-	-	-	
Onawa	4	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sangerville	11	30	-	10	2	2	-	-	-	-	-	-	-	-	-	-	-	-	
	52	129	1	36	12	8	200	-	-	-	-	-	2	-	2	-	-	-	
Somerset County.																			
Hartland	24	94	-	13	-	9	-	-	-	7	-	-	-	1	-	-	-	-	
Moose River	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
New Portland	31	71	2	8	2	7	-	-	-	-	-	-	-	-	-	-	-	-	
	56	169	2	21	2	16	-	-	-	7	-	-	-	1	-	-	-	-	

Improper and illegal sidewalk display of berries exposed to dust, flies and handling by customers.

REPORT OF THE CHIEF OF THE BUREAU OF INSPECTION ON THE ENFORCEMENT OF THE PURE FOOD LAW.

To the Hon. William T. Guptill, Commissioner of Agriculture:

I respectfully submit to you my report of the work covered by the Bureau of Inspection for the year 1915.

In general, my duties have been to enforce the statute regulating the sale of agricultural seeds, commercial feeding stuffs, commercial fertilizers, fungicides, insecticides, drugs and foods. The statute requiring that the quantity of the contents be marked on the outside of the package—in the case of food in package form if sold at a greater price than five cents—commonly known as the net weight law, having been added to chapter 119 (the pure food law), its enforcement has become a function of the Bureau.

The above mentioned chapter of P. L., 1911, that is, chapter 119, makes an annual registration necessary for each brand of commercial feeding stuffs, commercial fertilizers, fungicides and insecticides offered for sale in Maine; the conditions of such registrations are: First, the filing of a manufacturer's certificate for each and every one of the commodities mentioned bearing a distinguishing name or trademark, said certificate to contain a guaranteed chemical analysis; second, the payment of a proper registration fee.

The issuing of registration certificates, the book keeping and the large amount of correspondence that must necessarily attend the adjustment of the annual registration, are all features of the work of this branch of the department.

Several changes have been made during the year in the methods of inspection, but all samples collected by the inspectors have been promptly forwarded to the Agricultural Experiment Station, Orono, inasmuch as the statute provides that all analytical work authorized by the department shall be performed there. In the case of samples of fertilizers and of seeds, however, contrary to the custom of former years, they have been sent to the Station without description other than an index number; the complete information and history not being communicated until after a report of analysis has been received at this office.

Marked attention has been given to fertilizer inspection and more correspondents have taken advantage of the provisions of chapter 130, P. L., 1911, wherein the method of procedure for obtaining free analysis of fertilizer samples is outlined, than in previous years.

Two hundred and fifty towns and cities of Maine have been visited at least once, and many several times, by the inspectors, and an attempt has been made to maintain as complete an inspection as possible at all times in Portland, Bangor and Lewiston where, owing to the large population and varied industries, all branches of inspection work have seemed to be necessary.

As the consumption of feeding stuffs is greater in winter than during the other seasons of the year, the inspection of this commodity was vigilantly maintained throughout the winter months, suspended during the summer and resumed in the fall; fertilizer inspection began in the early spring and the bulk of the samples was taken by July first, although scattering samples were collected as late as October. The inspection of seeds was confined to the spring months and two inspectors were employed for the work, an attempt being made to visit towns previously unvisited. During the summer months the inspection of fungicides and insecticides was attended to and, although not a great number of samples was obtained, the visits of the inspector resulted in numerous registrations or the return by dealers to the manufacturers or jobbers of contraband goods; as for the inspection of foods and drugs, greater activity has been possible in this particular line of work and more samples have been collected than last year. As stated above, all samples have been forwarded to the Experiment Station for analysis and, as the results of these analyses have been published with detailed tabulations in the form of Official Inspections, it seems unnecessary for me to do more than to refer to the number of the Official Inspections or other publications where such detailed information relative to the commodities analyzed has been given.

Delivering unwrapped bread, exposed to dust and other contamination.

I wish to emphasize the fact that much attention has been given to certain lines of factory inspection, care having been taken to investigate the places where different products designated for intrastate and interstate trade are manufactured, particularly the sardine factories; this subject will be treated in detail under a separate heading in this report.

The year has been marked by the encouraging reports of the inspectors as to the readiness of the dealers to comply with the requirements of the net weight law and the very general acceptance of the statute providing for the marking of the quantity of the contents in the case of package goods, particularly the marking of butter.

Towns Inspected.

From the following tables it will be noted that, during the year 1915, two hundred and fifty towns, with a total population of 605,383, have been visited, many of them more than once, and in the three largest cities—Portland, Bangor and Lewiston—a continuous inspection has been maintained; it should be borne in mind that through a complete inspection in the centres of trade, not only the population of these places but of the surrounding country as well have been protected.

These tables and figures are shown with the idea of communicating to the public the number of people and amount of territory under inspection:

CITIES AND TOWNS VISITED AND INSPECTED, 1915.

City or Town.	County.	Number Times Inspected.	Population.
Addison	Washington	3	985
Albion	Kennebec	2	922
Alfred	York	2	890
Alna	Lincoln	2	457
Anson	Somerset	5	2,209
Ashland	Androscoggin	2	2,173
Auburn	Androscoggin	12	15,064
Augusta	Kennebec	13	13,211
Baldwin	Cumberland	3	791
Bangor	Penobscot	18	24,803
Bath	Sagadahoc	9	9,396
Belfast	Waldo	8	4,618
Benton	Kennebec	3	1,194
Berwick	York	2	2,098
Bethel	Oxford	2	1,930
Biddeford	York	3	17,079
Bingham	Somerset	2	775
Blaine	Aroostook	1	1,013
Boothbay	Lincoln	1	1,700
Boothbay Harbor	Lincoln	2	2,021
Bowdoin	Sagadahoc	1	814
Bowdoinham	Sagadahoc	5	1,385
Bradford	Penobscot	3	930
Bradley	Penobscot	2	634
Bremen	Lincoln	1	550
Brewer	Penobscot	3	4,835
Bridgewater	Aroostook	1	1,013
Bridgton	Cumberland	4	2,660
Bristol	Lincoln	1	2,415
Brooklin	Hancock	2	936
Brooks	Waldo	2	704
Brownfield	Oxford	3	933
Brownville	Piscataquis	2	1,808
Brunswick	Cumberland	11	6,621
Buckfield	Oxford	2	1,087
Bucksport	Hancock	3	2,216
Buxton	York	2	1,675
Burnham	Waldo	3	733
Calais	Washington	3	6,116
Cambridge	Somerset	1	369
Camden	Knox	3	3,015
Canaan	Somerset	1	874
Canton	Oxford	2	1,013
Cape Elizabeth	Cumberland	2	1,857
Caribou	Aroostook	3	5,377
Carmel	Penobscot	2	1,050
Castine	Hancock	1	933
Charleston	Penobscot	2	864
Chelsea	Kennebec	1	3,216
Cherryfield	Washington	4	1,499
China	Kennebec	3	1,297
Clinton	Kennebec	3	1,268
Columbia	Washington	1	564
Columbia Falls	Washington	1	663
Corinna	Penobscot	2	1,237
Corinth	Penobscot	2	1,042
Cornish	York	3	954
Cumberland	Cumberland	2	1,403
Damariscotta	Lincoln	2	771
Danforth	Washington	2	1,295
Denmark	Oxford	1	596
Dennysville	Washington	1	459
Detroit	Somerset	1	461
Dexter	Penobscot	6	3,530
Dixfield	Oxford	2	1,056
Dixmont	Penobscot	1	757
Dover	Piscataquis	4	2,091
Dresden	Lincoln	1	815
Durham	Androscoggin	3	1,625
East Livermore	Androscoggin	3	2,641

CITIES AND TOWNS VISITED AND INSPECTED, 1915.

City or Town.	County.	Number Times Inspected.	Population.
East Machias	Washington	2	1,392
East Millinocket	Penobscot	2	923
Easton	Aroostook	2	1,301
Eastport	Washington	3	4,961
Eddington	Penobscot	1	611
Eden	Hancock	5	4,441
Eliot	York	2	1,530
Ellsworth	Hancock	5	3,549
Enfield	Penobscot	2	970
Fairfield	Somerset	3	4,435
Falmouth	Cumberland	3	1,488
Farmington	Franklin	4	3,210
Fort Fairfield	Aroostook	5	4,381
Fort Kent	Aroostook	2	3,710
Foxcroft	Piscataquis	5	1,867
Frankfort	Waldo	3	1,157
Franklin	Hancock	2	1,161
Freedom	Waldo	4	480
Freeport	Cumberland	3	2,460
Friendship	Knox	1	776
Fryeburg	Oxford	5	1,282
Gardiner	Kennebec	9	5,311
Garland	Penobscot	1	817
Gorham	Cumberland	5	2,822
Gouldsboro	Hancock	1	1,349
Gray	Cumberland	5	1,270
Greene	Androscoggin	2	773
Greenville	Piscataquis	2	1,474
Guilford	Piscataquis	2	1,680
Hallowell	Kennebec	5	2,864
Hampden	Penobscot	4	2,380
Hancock	Hancock	2	843
Harmony	Somerset	2	730
Harrington	Washington	3	1,020
Harrison	Cumberland	4	967
Hartford	Oxford	2	592
Hartland	Somerset	2	1,176
Hebron	Oxford	2	603
Hermon	Penobscot	2	1,210
Hiram	Oxford	4	945
Holden	Penobscot	2	609
Hollis	York	3	1,284
Houlton	Aroostook	5	5,845
Howland	Penobscot	2	494
Hudson	Penobscot	1	403
Industry	Franklin	3	465
Island Falls	Aroostook	3	1,686
Islesboro	Waldo	1	877
Jay	Franklin	2	2,987
Jefferson	Lincoln	1	1,030
Jonesboro	Washington	1	519
Jonesport	Washington	3	2,074
Kenduskeag	Penobscot	2	481
Kennebunk	York	4	3,099
Kennebunkport	York	3	2,130
Kingfield	Franklin	1	927
Kingman	Penobscot	2	741
Kittery	York	7	3,533
Lamoine	Hancock	2	482
Lebanon	York	1	1,316
Leeds	Androscoggin	1	990
Levant	Penobscot	1	707
Lewiston	Androscoggin	18	26,247
Liberty	Waldo	2	650
Limerick	York	1	965
Limestone	Aroostook	3	1,293
Limington	York	2	980
Lincoln	Penobscot	4	1,988
Lisbon	Androscoggin	7	4,116
Livermore Falls	Androscoggin	5	1,100
Lubec	Washington	3	3,363

CITIES AND TOWNS VISITED, AND INSPECTED, 1915.

City or Town.	County.	Number Times Inspected.	Population.
Ludlow	Aroostook	1	412
Machias	Washington	4	2,089
Machiasport	Washington	2	1,318
Madawaska	Aroostook	2	1,831
Madison	Somerset	6	3,379
Mars Hill	Aroostook	3	1,511
Masardis	Aroostook	1	650
Mattawamkeag	Penobscot	1	517
Mechanic Falls	Androscoggin	5	1,678
Mexico	Oxford	2	2,065
Milford	Penobscot	1	967
Milbridge	Washington	2	1,550
Millinocket	Penobscot	5	3,368
Milo	Piscataquis	5	2,556
Minot	Androscoggin	2	786
Monmouth	Kennebec	5	1,386
Monson	Piscataquis	3	1,243
Monticello	Aroostook	3	1,297
Mount Desert	Hancock	2	1,569
Naples	Cumberland	2	736
New Gloucester	Cumberland	3	1,228
Newburg	Penobscot	2	694
Newcastle	Lincoln	2	1,066
Newport	Penobscot	6	1,747
Nobleborough	Lincoln	2	775
Norridgewock	Somerset	6	1,608
North Yarmouth	Cumberland	2	686
Norway	Oxford	4	3,002
Oakfield	Aroostook	3	928
Oakland	Kennebec	5	2,257
Old Orchard	York	3	961
Old Town	Penobscot	5	6,317
Orland	Hancock	3	1,224
Orono	Penobscot	6	3,555
Oxford	Oxford	2	1,221
Palermo	Waldo	2	690
Palmyra	Somerset	1	960
Paris	Oxford	4	3,436
Parsonsfield	York	3	1,057
Passadumkeag	Penobscot	4	445
Patten	Penobscot	4	1,406
Pembroke	Washington	2	1,091
Perry	Washington	2	1,153
Peru	Oxford	2	746
Phillips	Franklin	2	1,423
Pittsfield	Somerset	6	2,891
Poland	Androscoggin	2	1,382
Portland	Cumberland	31	58,571
Pownal	Cumberland	2	625
Presque Isle	Aroostook	4	5,179
Princeton	Washington	3	1,091
Randolph	Kennebec	2	1,017
Rangeley	Franklin	2	1,154
Raymond	Cumberland	1	677
Readfield	Kennebec	1	996
Richmond	Sagadahoc	5	1,858
Robbinston	Washington	1	691
Rockland	Knox	6	8,174
Rockport	Knox	3	2,022
Rome	Kennebec	1	584
Rumford	Oxford	6	6,777
Saco	York	5	6,583
Sanford	York	5	9,049
Sangerville	Piscataquis	2	1,319
Scarboro	Cumberland	5	1,945
Searsmont	Waldo	2	828
Searsport	Waldo	3	1,444
Sebago	Cumberland	3	536
Sherman	Aroostook	2	1,053

CITIES AND TOWNS VISITED AND INSPECTED, 1915.

City or Town.	County.	Number Times Inspected.	Population.
Skowhegan	Somerset	5	5,341
Smyrna	Aroostook	1	411
Solon	Somerset	2	1,034
South Berwick	York	2	2,935
South Portland	Cumberland	7	7,471
Southwest Harbor	Hancock	1	888
Standish	Cumberland	5	1,637
Stockholm	Aroostook	2	715
Sullivan	Hancock	3	1,132
Sumner	Oxford	1	762
Thomaston	Knox	5	2,205
Thorndike	Waldo	1	525
Topsham	Sagadahoc	3	2,016
Tremont	Hancock	1	1,116
Trenton	Hancock	1	354
Union	Knox	3	1,233
Unity	Waldo	2	899
Vanceboro	Washington	1	623
Van Buren	Aroostook	2	3,065
Vassalboro	Kennebec	2	2,077
Veazie	Penobscot	1	577
Waldoboro	Lincoln	2	2,656
Washburn	Aroostook	2	1,583
Waterville	Kennebec	9	11,458
Webster	Androscoggin	2	1,213
Wells	York	3	1,908
Westbrook	Cumberland	6	8,281
West Gardiner	Kennebec	1	629
Whitefield	Lincoln	2	1,056
Wilton	Franklin	3	2,143
Windham	Cumberland	2	1,954
Windsor	Kennebec	1	706
Winn	Penobscot	2	655
Winslow	Kennebec	4	2,709
Winterport	Waldo	2	386
Winthrop	Kennebec	5	2,114
Wiscasset	Lincoln	2	1,287
Woodland	Aroostook	2	1,161
Yarmouth	Cumberland	4	2,358
York	York	2	2,802
Total population of cities and towns inspected			605,383
Different cities and towns visited			250

Seed Inspection.

The seed inspection for the year 1915 was attended to by men employed particularly for this work, the subject of marking and displaying seeds by the dealers being followed up thoroughly. During the season the inspectors visited one hundred and fifty-four towns and cities in Maine, calling upon three hundred and eighty-three dealers; they collected three hundred and thirty-three samples, besides examining numerous varieties of seeds that apparently did not warrant sampling. I regret to report that of the three hundred and thirty-three samples collected, eighty-two cases necessitated hearings, either on the charge of misbranding or adulteration. I am very glad to say, however, that I have every reason to believe that most of the cases were not wilful violations but the result of carelessness, and some were purely technical.

A point that seems to warrant discussion is whether or not seeds obtained by the cooperative plan, the system followed by the several Farmers Unions of the state, require—as those obtained by dealers—the percentage of purity marked on the packages; this subject having been considerably aired during the year as a result of the inspectors finding packages of seeds as above not marked as has been the custom of the dealers, the matter was presented to the Attorney General and his opinion asked; in his reply he affirms that the same requirements should apply to seeds purchased cooperatively as to those offered for sale by dealers. It also appears that it was the intention of the statute to outline such requirements.

The results of the analyses of seed samples, together with the names of the dealers from whom the samples were taken, may be found in Official Inspections No. 73.

Feeding Stuffs Inspection.

The feeding stuffs inspection for 1915 was carried on actively from January to June, then dropped for a time and again taken up the latter part of October, while of course throughout the whole year the inspectors who have been in the field employed with other duties have been instructed to be on the lookout for violations in the way of unregistered goods, etc. The total number of feeding stuffs registered for 1915 was five hundred and thirty-eight, or nearly one hundred more brands than for the previous season; these brands included a great variety of feeds—cottonseed meals, cottonseed feeds, gluten meals, linseed meals, dried distillers' grains, feed flours, middlings, bran, mixed feed; also numerous miscellaneous compounded feeds and a long list of poultry feeds.

It was the duty of the inspectors when carrying on the feeding stuffs inspection to call upon all the principal places in the state where feeding stuffs were offered for sale, look over the stock carefully in order to ascertain if all the brands were properly registered, and take samples for analysis; the samples were then sent direct to the Station and, when a report of the analysis was received at this office, the protein, fat and fibre

Glass display case for berries and confectionery affording proper protection from dust, flies, etc.

content were compared with the guarantees contained in the manufacturer's certificate and the label on the package in order to find out whether or not the dealers or consumers were receiving the goods as guaranteed to them; however, even with this thorough method of inspection, without the close cooperation of the feeding stuffs dealers we could not hope to obtain a satisfactory index of the goods offered for sale in the state; we have, therefore, invited and urged the dealers to draw samples of feeding stuffs—especially cottonseed meals—as soon as shipments were received and forward to the Station for analysis. The dealers have been furnished with forms for describing feeding stuffs samples and directions for the collection of same, and a supply of the forms may be secured at any time upon application to this Bureau.

At this time I wish to state that it became quite apparent during the early part of the year that the offer of free analysis was being taken advantage of in a way to commercialize the laboratory, claims for settlement between dealers in the state and manufacturers beyond its borders being based upon the results of the examinations; for this reason it was decided not to report the numerical results when a sample was found to be up to or above the guaranty, but when a sample has fallen below the guaranty the numerical results have been reported and such action taken as provided by statute. This plan has apparently been quite strongly opposed by the feed dealers who have been affected, but it seemed best to adhere to the above method and thus, if possible, bring about the abolition by feed manufacturers of the sliding scale guaranty. It is understood, of course, that consumers are anxious to know the amount of protein they are getting in a feed, especially when compounding a ration for their dairy herds, and when samples were submitted by such persons the numerical results were in all instances reported.

The cooperative work with the federal department in the enforcement of the food law, which embraces in its scope products intended for food for animals as well as for human consumption, has under these provisions made it possible when a sample of feeding stuff has been found deficient for the deputy who drew the sample to secure documentary evidence proving interstate shipment of the goods in question; the case has then been reported to the federal authorities with recommendations for prosecution. This has added greatly to the efficiency of the inspection work and has enabled us to place the blame where blame was due and not upon the innocent dealer living within the state.

Fertilizer Inspection.

The work along the lines of fertilizer inspection has been particularly active; inspection began in the early spring months with the collection of samples and reporting unregistered brands. Samples were obtained from storehouses and from agents and, contrary to any previous plan of sampling, particular attention was given to the weighing of unbroken packages and also to the taking of samples of goods in the hands of individuals. A new departure was also inaugurated in sending the samples collected to the laboratory marked only with the inspector's number and not accompanied by any information relative to the guaranteed analysis, the name of the manufacturer, or the location from which it was obtained. Another feature which marked the fertilizer inspection for the year 1915 was an increase in the number of correspondents who took advantage of the provisions outlined in chapter 130, P. L., 1911, as amended by P. L., 1913, chapter 140, whereby a free analysis can be obtained for a sample of fertilizer which has been taken in accordance with the requirements of this department by a correspondent, provided it shall be found that not more than one sample of the same brand has been analyzed by the Commissioner within the year, or if the results of the analysis show the sample to be of public importance. Samples were received from six correspondents and of that number, either because of a deficiency in the goods or because the sample sent was the only one of the brand to be analyzed, all but one received his analysis fee in return.

The total number of samples collected as official samples through the year was five hundred and fourteen; of this number fourteen brands were found to be unregistered and hearings were arranged with the dealers handling the goods. In one case in particular the dealer found offering the unregistered goods was fined and he readily settled for the offense;

registration was not effected, however, as it did not seem desirable to have this class of goods offered for sale in the state of Maine. In other cases, it transpired that the goods were shipped direct from the manufacturer to the consumer and thus no registration was required.

The analyses of fertilizer samples for 1915 are contained in Farmers' Bulletin on Fertilizers, issued from your office in December, 1915; also in Official Inspections No. 74.

Particular attention was called to certain brands by deficiencies found in samples submitted by correspondents, and upon following up these brands and taking official samples other deficiencies were noted. It seems necessary, therefore, to give a rather comprehensive report of the relations of this department with the companies offering such goods for sale.

The Armour Fertilizer Company.—February 6, 1915, a sample of fertilizer was received at the department from Ellis Logan of Houlton and was forwarded to the Experiment Station for analysis. On March 13, Mr. Logan was informed of the station's findings; in reply to this report, Mr. Logan volunteered the information that the sample in question was Armour's Bone, Blood & Potash, carrying a guaranty of nitrogen 4.11%, available phosphoric acid 9.00%, total phosphoric acid 8.00% and potash 7.00%, while the results of the examination were: Nitrogen 3.41%, available phosphoric acid 6.57%, total phosphoric acid 7.77% and potash 6.09%. A comparison of the analyses was then made with the manufacturer's certificate filed at this office by the Armour Fertilizer Company. The deficiency found seemed sufficiently great so that the analysis was deemed of public importance and the fee of ten dollars was returned to Mr. Logan on March 19. Having learned that the J. N. Adams Company was responsible for the sale of the deficient goods to Mr. Logan, following the provisions of the statute under section 15, chapter 119, P. L., 1911, as amended by P. L., 1913, chapter 140, a hearing was arranged with this concern and an opportunity given them to make explanation for the alleged violation; finally, after considerable correspondence with W. T. Anderson, a local agent for the Armour Fertilizer Company, he appeared for the J. N. Adams Company, but at this time no definite settlement of the case was suggested and the matter was held in abeyance pending further investigations. Court proceedings were not instituted, however, on this case as the analysis had revealed that the sample in question carried a high moisture content. When the fertilizer inspection was begun in Aroostook county, deputies of the department whose duties were to take fertilizer samples, were explicitly instructed to obtain samples of the Armour goods and pay particular attention to any samples similar or of the same brand as the one sent by Mr. Logan. These instructions were carried out and as a result seven samples of Bone, Blood & Potash Fertilizer were collected, all of which showed more or less deficiency. As a result of these findings, and also taking into consideration the earlier analysis of the sample received from Mr. Logan, a hearing was arranged with W. T. Anderson, agent for the Armour Fertilizer Company and Tuscarora Fertilizer Company, for July 1, 1915, and at the time appointed Mr. Anderson and W. N. Martin of Baltimore, attorney for the Armour Fertilizer Company, appeared and presented testimony in behalf of the company. At this time no definite settlement of the case was arranged for. Other conferences followed under date of July 13, August 4 and August 9; others appearing at the later conferences were: Mr. Humphreys of the Chicago office of the Armour Fertilizer Company, Mr. Phelps, Chemist from the Chrome factory, and Leonard Pierce, attorney, from Houlton. At the time of the conference of August 9, Mr. Humphreys laid considerable stress upon the high moisture content of the samples, advocating that considerable allowance should be made in the interpretation of the analyses. None of these conferences resulted in any definite settlement and, upon receipt of additional reports of analyses, we seemed to be in possession of information which warranted some action and steps were taken to ask the Armour Fertilizer Company for a settlement before the court. It did not seem to be good policy to ask for prosecution in all the cases in which a deficiency had been shown, but one was selected which seemed sufficiently large to warrant proceedings; the sample selected for the case is described as follows: Collected under inspectors number L G 155, analyzed as Station No. 3310, designated under the trade name "Double Value," manufactured by the Tuscarora Fertilizer Company of Chrome, N. J., collected from George

H. Stone, Fort Fairfield, May 13, 1915. The goods from which this sample was taken were purchased under the following analysis:

Total nitrogen.	Avl. phosphoric acid.	Total phosphoric acid.	Water soluble potash.
4.11%	8.00%	9.00%	10.00%
The result of the analysis of the sample showed:			
3.95%	7.83%	8.34%	9.79%

showing a deficiency in all the ingredients.

The services of Bernard Archibald, County Attorney of Aroostook county, were enlisted and on October 20, 1915, criminal proceedings were instituted against the Armour Fertilizer Company before Judge Fessenden, a Trial Justice of Fort Fairfield, and an attempt was made to present to him fairly and impartially the facts of the case and the evidence at hand. After the evidence for the state had been presented, without hearing the defense of the Fertilizer Company, Judge Fessenden declared a non suit and the defendants were discharged.

The Standard Guano Company.—Another brand of fertilizer which attracted our attention was the product of the Standard Guano Company. Advices were received from Rufus P. Ayer of Freedom that he had recently purchased twenty tons of Five—Eight—Seven Fertilizer, manufactured by the Standard Guano Company, and that—having sent samples to a chemist—had received an analysis showing a marked deficiency in potash. As a result of this report, a deputy of the department was sent to Freedom with instructions to take samples not only of the goods found at Mr. Ayer's but also from any that might have goods from the same carload lot, or from any of the same brand that he might find in that vicinity. As a result of this inspection, two samples of Five—Eight—Seven, manufactured by the Standard Guano Company, were obtained from Rufus P. Ayer, and two other samples of Five—Eight—Seven were taken from Nicholas Walton of Thorndike, one sample of Four—Eight—Four from E. W. Downer, Freedom, and a sample of Four—Eight—Seven from each, E. W. Downer of Freedom and Robert W. Betts of Thorndike; later, other samples of Five—Eight—Seven were obtained in other parts of the state. While the analysis for the official samples obtained did not show as great a deficiency as the one reported by Mr. Ayer, practically all of the samples examined were found low in nitrogen and potash. After considerable correspondence and an attempt to gain an interview with the officials of the Standard Guano Company, a hearing was arranged for Wednesday, August 4, with Robert W. Betts, Manager of the Thorndike Farmers Union. Those present at the hearing were: Robert W. Betts, who answered to the summons on the charge of distributing fertilizer as agent for the Standard Guano Company, John E. Nelson, attorney for Mr. Betts, and Mr. Robinson, vice-president of the Standard Guano Company. At the time of this hearing, Mr. Betts admitted that—acting as a distributing agent—he had supplied Mr. Ayer with the fertilizer in question; he also admitted the sale, under the same conditions, to Mr. Walton.

After considerable discussion, and without a definite plan for settlement being reached, the hearing was adjourned and the case still remains unsettled.

The New Mineral Fertilizer Company.—Our particular attention was again called during the past year to the New Mineral Fertilizer which, although under a new name, was being advertised and sold as "Nature's Plant Food." Early in the season the inspectors reported finding these goods in a farmer's possession. Our attention was also drawn to the product by the advertisements of the company. Examination of our file showed that no manufacturer's certificate had been filed or registration fee paid for the year 1915. The fact was also taken into consideration that prosecution of this concern was begun in 1914 and on two charges indictments were made and true bills found by the Grand Jury of Cumberland County. In the meantime, a change having occurred in the county officials, the matter of previous prosecution was taken up with the new County Attorney by personal interview and by correspondence. On May 11 a letter was received from the County Attorney informing us that he would be unable to proceed against the fertilizer company. The matter was then brought to the attention of the Attorney General, who wrote to the County Attorney of Cumberland county, asking that the case be continued to the next term, pending a consultation relative to further prosecution; too late, however, to be of any avail as the cases were nol prossed on recommendation of the County Attorney under date of May 13, 1915.

Deputies of the department again visited the plant of the New Mineral Fertilizer Company at Rumford and found upon the examination of the freight records that from April 9 to June 2 twelve carloads, averaging about twenty-two tons to the carload, had been shipped; the railroad accounts, however, did not reveal that any intrastate shipments had been made, all of the goods having been sent beyond the state borders. As for the results of the analyses of the samples taken this year, they are essentially the same as previous analyses have shown. A sample was taken from an individual who seemed to believe explicitly in the value of the goods, and this examination seemed to show that the product carried no added plant food.

As far as possible the financial condition of the company was investigated. The status of the case was again outlined in correspondence with the County Attorney of Cumberland county, but I regret to report that the matter still remains in an unsettled state.

Fungicides and Insecticides Inspection.

The inspection and registration of fungicides and insecticides were not as laborious as in previous years; this seemed to be partly due to the fact that the law, being a year older, was more clearly understood; there also seemed to be a better understanding on the part of the dealers as to the definition of insecticides. The year was marked by some increase in the number of registrations, but I regret to report that the number of samples collected was very small, only thirty-three being taken. The variety, however, included most of the substances used by agriculturists in repelling, mitigating and exterminating the different insect pests which infest vegetation and animals: Arsenate of lead, arsenate of zinc, Paris green, lime-sulphur solution, lice killers, moth repellents, larkspur lotions, "Rat-Bis-Kit" Paste (carrying insecticidal claims), Cooper's sheep dipping powders, etc.

As for the results of the analyses, not one of the samples taken showed a serious deficiency. A few cases were found unlawfully exposed, as the package did not bear the proper marks indicating the quantity of the contents as required by the statute, but in all cases they have been found up to the guaranty of the manufacturers and no hearings on this charge were necessary, and although offering every facility available for soliciting such information, we have not received any complaints from the users of any insecticide as to the failure of any product to successfully do the work that it was guaranteed to do. This seems particularly gratifying as the sale and consumption of arsenate of lead has increased rapidly for combating insects infesting potato plants and it is also employed for repelling the attacks of the gypsy and brown-tail moths.

In general, a clearer understanding has been reached between the manufacturers and this department as to the registration; however, one hundred and sixty-two hearings were arranged during the year as the result of the inspector locating unregistered goods.

Reports of analyses will be found in Official Inspections No. 75.

Drugs Inspection.

The work of drugs inspection was largely delegated to one inspector; this arrangement proved to be satisfactory. The drug stores have not been entirely neglected, however, by other inspectors when performing general inspection work, but the consistent use of the tabulated form of report for drug stores has been employed mostly by one man who paid particular attention to this line of work. The general conditions of the stores visited were reported and information gained as to the marking of bottles with the alcohol content; cleanliness of the prescription counter and—if soda fountains are installed—the cleanliness of the glasses and other utensils used, the source of the syrup and sanitation were all noted upon the form provided for this purpose. Violations thus reported and noted have been taken up in an educational manner and numerous letters calling them to the attention of the dealers have been written.

During the latter part of the year samples were collected and are now being analyzed; the results of the analyses are not now available. Particular attention has been given to sampling Sweet Spirit of Nitre, Tincture of Iodine, Spirit of Gaultheria, Spirit of Peppermint and Spirit of Camphor. In all, seventy-one drug samples have been collected.

Food Inspection.

Education, inspection and prosecution have marked the different methods adopted for this line of work. The collection of samples represented only in a small way the amount of work accomplished. The inspection work among grocery stores and markets was marked by the friendliness of the dealers in the acceptance of the advice of the deputies and readiness to comply with any suggestions for the fulfilment of the statute. In several cases new windows and refrigerating facilities were installed as the result of such advice on the part of the inspectors.

Grocery Stores and Markets.—Wherever food is dispensed in grocery stores and markets, the inspectors have noted the general conditions of the place as to the cleanliness of the walls, floors, shelves and counters, and in fly season they have noted particularly if screens were used. Meat rooms and refrigerators have been examined and the condition reported. Inquiry as to the general health of the employees has been made and their condition noted from observation. Dealers have been questioned as to the proper labeling of lard, molasses, sausage and vinegar when sold in substitution for the real article. The general habits of the dealers have also been judged in the matter of wrapping of bread and the protection afforded food of all kinds.

Numerous technical violations have been treated in an educational way and an attempt made to remedy the conditions found.

Restaurants.—The inspection of hotels, particularly the dining rooms, and of lunch rooms, restaurants, lunch carts and, in fact, every place where food has been offered for sale, has been carried on as fully as possible with the means appropriated and the force of inspectors employed; particularly noting the light, ventilation and cleanliness of each place and the health of the employees. Reports are made, also, as to the condition of the dishes and utensils used as well as in regard to the refrigerating facilities.

Food Factories.—We have attempted to investigate as far as possible, and within our means, the conditions of the food supply which would in any way affect the public health, with particular reference to bakeries, slaughter houses, bottling works, canning factories and condensed milk factories, endeavoring always to assist and advise with the end in view of producing a cleaner and better product. Our particular attention has been directed to two of our principal industries—the packing of corn and sardines—to which more space will be devoted later in my report.

Bakeries.—Realizing the great importance that care should be taken in handling bread, we have attempted to investigate the methods used in dispensing this product, not only in the shop but on the delivery teams and in stores. Bread, when it comes from the oven, is probably in a sterilized condition; this can be truthfully said of both the surface of the loaf and of the interior. However, this is the last sterilizing process the bread receives before being consumed, as a very small amount of bread is subjected to any further heating or toasting process. It is therefore evident that bread should be kept at all times, in order to be suitable for food, carefully protected and, to this end, the inspectors have attempted to advise the drivers of bakery teams to be particularly cleanly in their habits and in the matter of handling unwrapped bread. In most cases our advice has been gratefully received and usually heeded, but there is still chance for improvement. Bakers have readily agreed that if for no other than economic reasons it was to their advantage to wrap bread. There are certain kinds—like the Vienna and French loaves—which, owing to the lack of uniformity in shape, make it difficult to insist on protection by wrapping; for this class of goods our recommendations have been to handle as little as possible, and with particular care when handling is absolutely necessary.

Bottling Establishments.—During the summer of 1915 an investigation of the bottling establishments—where carbonated beverages or bottled soda are manufactured—in Maine was carried on. Not a large number of samples was taken, although rather a minute inspection was made of a large quantity of the goods which was held in stock and, when it seemed to warrant, samples were taken. Samples were also taken early in the summer as the result of a complaint that there were suspicions that a certain firm in the state was using saccharine in place of sugar for sweetening. As the use of this product was prohibited by a ruling of January 1, 1912, pains were taken at once to secure samples and examine them but the findings showed that no saccharine was present.

Numerous complaints have been made, and it was also evident to the inspectors, that many manufacturers of the state were using misbranded bottles bearing the names of other manufacturers; this, however, seems to be a matter which should be settled by the Bottlers' Association through their Bottlers' Exchange and not one which should be added to the duties of this department.

Particular attention was paid to the sanitary inspection of the bottling establishments and, unfortunately, not all could be given a clean bill of health. In one instance, with the assistance of the local Board of Health, one of the bottling establishments was closed for four days while repairs were made and a renovation and cleaning took place. In some of the places the floors were found very dirty, the toilet facilities were not properly arranged and the absence of screens noted. All of the concerns, however, should not be condemned by the fault of the few, and many of the bottlers are attempting to place upon the market a clean product; but, at best, the possibilities for contamination where no process of sterilization takes place in the filling of the bottles, is very great.

Corn Factories.—One important industry for which Maine holds an enviable reputation, is the growing and canning of sweet corn. We have been frequently reminded of the superiority of the Maine grown product by letters received from manufacturers in other states asking how they might legally label their goods and still intimate to the consumer that their products were in some way identified with the State of Maine.

We regret to report that not as complete an inspection of corn factories was made as we could have wished although we have not suspected that any more than technical violations were being committed. A complete inspection, however, was prevented by the shortness of the season and the geographical position of the factories, but from what we were able to observe it is our belief that the average corn packer of the State of Maine has been trying not only to comply with the pure food laws, but has been attempting to place on the market a product that would measure up to the standard of excellence of which the Maine grown product is capable.

Sardine Factories.—It is with extreme reluctance that we make the admission that we cannot point with a great feeling of pride to our sardine industry and, to say the least, it is indeed humiliating to read from no less authority than an encyclopaedia account on sardines, the following statement deprecating the quality of the Maine product: "The product is distinctly inferior to the best or even middle grade of French sardines."

In fact, for some time doubt has been expressed by consumers and, unfortunately, by packers themselves as to whether or not the fish which are used for sardines on the coast of Maine are capable of being so prepared as to equal the sardines of France or Norway. Basing our assertions on good authority we find that Clupea pilchardus of France, Clupea coeruleus of California and Clupea harengus of the Maine coast may all properly come under the name of "sardine," and we feel safe in asserting that the character of the species of fish taken on the Maine coast does not offer any obstacle that cannot be overcome, and it is very probable—as proven by the investigation of the best authority—that the superiority maintained by the French product depends more upon the selection and method of treatment than upon the natural character of the species, and any endorsement or assistance that can be given to the packers to dispel the idea that Maine sardines cannot be made a product which from their excellence will be desired as a food, should be as large a part of our duty as to enforce the laws.

We have thus paid particular attention to the inspection of sardine factories during the summer of 1915. We were particularly fortunate in securing the cooperation of the United States Department for our investigation and through their good offices an inspector of the federal department accompanied our inspector throughout the tour of inspection. I also wish to mention that the state inspector delegated to make the investigations exhibited unusual interest in his work, excellent judgment in his recommendations and presented fair and impartial reports of conditions found, and that the inspector of the federal department who accompanied him was a man well equipped by experience of years in factory inspection and in the examination of food products all over the United States. The work accomplished by these men was harmonious throughout and their attitude fair to all concerned, carefully investigating the methods employed and making rather minute inspection in thirty of the forty-five factories in the state, while practically all of the factories were visited. Detailed reports as to the conditions found were obtained and have been tabulated and filed. Space does not afford an opportunity to give a complete report of our findings, but I am enumerating briefly the principal observations: Fish ready to be packed were found in a belly blown condition and in a decomposed state; such fish were condemned and sent to the fertilizer factories; ninety-two hogsheads of fish were condemned in a day at some of the plants. Racks, pens, tables and flakes were found in a dirty condition; the ceilings of some rooms were dripping upon the tables in the room below; many of the factories were without screens, and the flies were thick; in some places the toilets were not conveniently arranged, many were without facilities for washing, and some factories were not equipped with soap and towels. It is unfortunate that the methods observed occasioned particular investigation of the product in the market and, as a result, several thousand cases of sardines have been seized in the last few months.

From the physical condition of a sardine factory, it is understood that it is not possible to keep such a place in immaculate condition. It is to be regretted that at first the attitude assumed by some of the sardine packers was not exactly amicable and that our intentions, which were not other than friendly and sincerely instituted in their behalf, were misjudged, but as an acquaintance between the inspectors and packers developed and our real object realized, many of the suggestions were heeded.

Although we feel that we had sufficient grounds for instituting court proceedings and successfully maintaining cases against some of the packers, no prosecutions were made. We did, however, attempt to advise sensibly—carefully avoiding recommendations for the installation of expensive equipment or any over-nice ideas. We did not recommend that a manicurist should be in attendance in all factories, but the packers were continually advised as to the proper selection of fish, and as for sanitation, our recommendations were for cleanly and convenient toilets and dressing rooms; that soap and clean towels should always be available; the discontinuance of the use of the common drinking cup and the installation of sanitary drinking fountains.

Aside from any duty to enforce the food laws charged to us, I feel that it should be our ambition, and that we should be particularly anxious, to overcome the prejudice against the Maine product and cooperate with the packers in securing for Maine sardines a reputation that can be referred to with pride. If such conditions can be secured, it must mean a greater demand, a greater production and therefore, a greater revenue must result. In 1909 Maine produced nine-tenths of the total sardines packed in the United States and the total value of the product for that year (and it is believed that it has been considerably increased since) was $4,609,224. I feel safe in asserting that with a change of methods to secure the conditions as above described, this revenue could be doubled.

Canning under State Inspection.—I wish again to emphasize the fact that under chapter 151, P. L., 1911, as amended by P. L., 1913, chapter 140, the opportunity is given and an option accorded for packing food in conformity with the requirements of the Maine Food Law; this requires the registration and payment of registration fee and calls for official inspection by deputies of this department but also—as reported previously —not one of the canners in the state improved the opportunity to ask for inspection relative to the packing of food for the year 1915.

COLLECTIONS OF FOOD SAMPLES.

Some of the food products collected for analysis have included maple sirup, molasses, sausage, condensed milk, flavoring extracts (including practically all flavors—vanilla, lemon, almond, peppermint and checkerberry), olive oil, bottled soda, clams, oysters, scallops, ice cream, vinegar, etc.

The sampling of oysters, clams, ice cream, vinegar and flavoring extracts has been general, collections having been made throughout the state. The other articles mentioned have been taken as the result of some complaint or some other special reason.

Flavoring Extracts.—In the late summer and early fall of 1915, about three hundred and twenty samples of flavoring extracts were collected; the results of the analyses of these samples are contained in Official Inspections No. 77.

An attempt was made to secure from the dealers goods manufactured within the state as well as the products of manufacturers located beyond its borders; we also endeavored to secure from the various druggists products of their own manufacture. Not only the pure vanilla and other flavors were obtained, but several of the imitations were found; in a very few cases the necessary branding indicated that it was an imitation product but quite frequently—probably due to the fact that they were old goods—the result of the analyses showed them to be a rather inferior product.

The newest phase of this statute, and one that has been treated up to the time of taking these samples in an entirely educational way, is the net weight law; the opportunity has now been given to judge how generally this statute was being complied with, and the results of these collections, giving as they have an opportunity to note the labels and the particular language used as well as to test the truth of the statements regarding the quantity of the contents, have been particularly gratifying.

It seems necessary to call attention particularly to a case of misbranding, where the carton was labeled plainly with the words "Extract of Vanilla" and with smaller type the language indicating that vanillin colored with caramel had been added. On the other side appeared the words "Extract of Vanilla" and also the word "Vanillin" in type nearly as large while the bottle label showed the words "Vanilla" and "Vanillin colored with caramel," the words "Vanillin colored with caramel" being in much smaller type.

Vinegar.—The taking of vinegar samples was carried on during the winter and spring and in each instance the inspector making the purchase asked for a quart of cider vinegar. The results of the analyses of these samples were reported at once to the Bureau and adulterated and misbranded cases were investigated. A few cases of short measure were reported. It is greatly to be regretted that a large amount of the vinegar which came under our observation was purchased from manufacturers outside of the state. The results of the analyses, together with a discussion of home making of vinegar, are published in Official Inspections No. 70.

Clams and Oysters.—During the spring of 1915, and again late in the fall and early winter months, general sampling was done on clams and oysters. The oyster situation is considerably improved; there is still, however, a great chance for improvement in the methods of dispensing clams, the results of analyses in many cases having shown that the clams had been allowed to remain in water and had thus been swollen. All these cases were promptly investigated. The general results of the analyses of these samples have been published in Official Inspections No. 66.

Ice Cream.—During the summer numerous samples of ice cream were collected and, while not from every single town in the state, the territory that was covered gave rather a careful index as to the quality of the goods that were being manufactured. The results have been most encouraging as practically all of the ice cream samples that were taken show a product of good quality and well above the standard. Although the exact numerical results are not given in Official Inspections for this year, the data reporting such samples will be found in Official Inspections No. 76.

Cooperative Work.

As has already been mentioned with particular reference to the collection of feeding stuffs samples, the efficiency of the inspection work has been greatly added to by the right of recommending prosecutions to the federal department by virtue of the authority delegated by the Collaborating State Officials Commission, and considerable active work along lines of cooperation between the United States department and the Maine department has been accomplished. Recommendations for federal prosecution for forty different cases have been made and papers proving interstate shipment in these instances have been forwarded together with our recommendations. The cases in question were largely cottonseed meals, mixed feeds, middlings and bran; there were, however, recommendations for interstate cases covering shipments of oysters, vinegar and condensed milk.

In connection with the clam and oyster industry, we have been supplied with much valuable data relative to the source and sale of oysters, and in the inspection of the sardine industry definite and constructive work has been accomplished by a union of forces.

The attentions which we have received and the courtesies that have been shown us by the federal department in supplying us with reports of seizures, regulatory announcements, reports of decisions and circular letters on a variety of subjects, have all tended toward the best interests of the work.

Fairs.

In several instances inspectors of the Bureau visited the chief fairs of the state and advised those found at such places dispensing food products as to the requirements of the law and attempted as far as possible to see that they were obeyed. There were instances, probably, where the law was violated; this seems to be a difficult proposition, however, to guard against as arrangements for dispensing food in such a way are in many cases not permanent, and the most approved methods along these lines cannot be accepted.

Report of the Display at the Portland Exposition.—A display of an educational nature was made by the Bureau of Inspection at the Portland Exposition, June 7-19, in co-operation with other branches of the Department of Agriculture.

Special endeavor was made to show in as many ways as possible the rights of the consumer as determined by statute and according to the standards established by the executor of the law for the different commodities which the Bureau attempts to regulate, and throughout the exposition employees of the department were present to explain the features of the exhibit. Extensive use was made of placards printed in type sufficiently large to be read at a distance, and literature was also distributed to the same effect, emphasizing at all times the instructions to "Read labels," "Report violations" and "Submit samples for analysis." The different kinds of feeding stuffs were exhibited—cottonseed meal with its different grades, etc., —avoiding, of course, that any particular brand should be advertised or discriminated against. A chemist from the laboratory at the Experiment Station was present for the entire duration of the exposition and demonstrated by chemical tests through the agency of fabrics the effect of analine dyes as found in ice cream and carbonated beverages; this proved to be most interesting and one of the particular features, attracting considerable attention to the booth. The simple tests of extracts were also demonstrated and the result of the net weight law as applied to this particular commodity was shown by a display of bottles previously employed. Other work of the chemist who was there was the demonstration of the acid test for vinegar and the performance of the process of fat extraction.

The charts issued by the Federal Government demonstrating the comparative nutritive values of the different kinds of feeds were another educational feature of the exhibit; also charts showing eggs in various stages of decomposition.

The sanitary paper ice cream dish, drinking cup and paper spoon employed for dispensing ice cream were also shown, in which a marked interest was noted; also fiber containers for dispensing milk and cream were displayed and successfully demonstrated.

Through the courtesy of a refrigerator manufacturer, a glass front refrigerator—such as is employed in stores—was loaned for the second week of the exposition and displayed. Other numerous interesting features relative to milk sanitation and cleanliness of milk were demonstrated by the Dairy Inspector, including the use of the Babcock test, sanitary milk pails and other equipment for producing clean milk. On the whole, it is hoped that much good resulted from the educational features of the exhibit.

Net Weight Law.

The net weight law was passed in 1913 and statutory provision of enforcement entrusted to the Department of Agriculture with other provisions of the pure food law; in this way the responsibility was charged to the Bureau of Inspection.

This statute—the newest of any phase of the pure food law—occupied much of the inspectors' attention for the first six months of the year. Inspectors, in connection with the other duties of their inspection work, noted the markings of packages and the findings have been most interesting.

The correspondence relative to the marking of butter has necessarily been very large, but the law has been almost universally complied with. In some instances the manufacturers of butter have included their name and address together with the required net weight which, while not necessary, is an action that is very commendable. Some little difficulty has been experienced in requiring the bakers to mark bread which is wrapped, but generally speaking the bakers within the state have apparently taken pains to meet the requirements of the law.

Occasionally canned goods and extracts have been noted which were on hand previous to the enactment of the law or, through an oversight on the part of an employee, were put on the market in a misbranded condition, but generally our experience in the enforcement of this statute has been pleasant and the results most gratifying.

Correspondence.

Correspondence of an educational nature has necessarily been large. Numerous technical violations have been reported by the inspectors but seemingly not serious enough to warrant prosecution; in these cases, warning letters have been written and with the accomplishment of apparently the same results as with the more laborious method of court proceedings as a remedy.

The correspondence occasioned by the registrations has been heavy. In many instances labels have been presented by manufacturers to be passed upon; these inquiries have always been given our prompt attention and in every way possible the manufacturers have been assisted wherever they seemed to deserve it.

Very few violations have been reported by individuals, most of the reported infractions coming from someone connected with the department; those which have been received have been given our prompt attention, however, and in every way possible the public has been informed that the reports of violations will be welcomed and carefully investigated.

Bulletins for Distribution.

It seems pertinent to announce that more comprehensive information relative to samples of foods, drugs, feeding stuffs, fertilizers, fungicides and insecticides is contained in bulletins published in the form of Official Inspections and designated by index numbers. Pursuant to the statute, these Official Inspections are published by the Director of the Experiment Station and contain the exact results of the samples submitted by the deputies of this department for analysis.

The list of the Official Inspections published by the Director of the Experiment Station, and bulletins, reports and regulatory announcements concerning the rules and regulations emanating from this Bureau is given below:

Official Inspections No. 66—Opened Shell Fish
67—Cream and Milk
68—Fungicides and Insecticides
69—Cream and Milk
70—Vinegar
71—Cream and Milk
72—Feeding Stuffs
73—Seed
74—Fertilizer
75—Fungicides and Insecticides
76—Ice Cream
77—Flavoring Extracts and Spirits

Bulletin No. 424—Drug Standards
425—Food Standards
—Laws of Maine regulating the sale of:
Agricultural Seeds
Feeding Stuffs
Fertilizers
Drugs
Foods
Fungicides and Insecticides

Regulatory Announcement No. 125—Ice Cream
126—Protection of Foods
127—Net Weight
130—Shell Fish
135—Dressed Poultry

MEETINGS.

I also wish to report that it has been my pleasure to attend and to speak at the following meetings during the year: The Federation of Women's Clubs in Augusta, January 4; The Farmers' Week in Orono, March 11; The Maine Anti-Tuberculosis Association in Lewiston, May 17, and in Bangor, May 19; the Maine Pharmaceutical Association in Rangeley, June 15-17. I also attended the exposition at Portland and the Dairymen's Conference in Lewiston.

In closing, I wish to express my appreciation to you for the encouragement and support given me in performing my duties throughout the year. I also wish to thank the county attorneys of the counties where prosecutions have been made; the Attorney General and Assistant Attorney General for their assistance; the Director and chemists of the Agricultural Experiment Station for their cooperation with me; the other members of the Department of Agriculture, particularly the deputies and clerks of the Bureau—my associates—for their kindness; the Press of the state who have universally been courteous and obliging in giving publicity to rulings, etc.; the Chief of the Bureau of Chemistry of the United States Department of Agriculture and his assistants, and all other officials who have in any way aided in the work pertaining to this office.

Respectfully submitted,

A. M. G. SOULE,

Chief, Bureau of Inspection.

REPORT OF PROCEEDINGS

OF THE

STATE DAIRY CONFERENCE AND ANNUAL MEETINGS

OF THE

MAINE DAIRYMEN'S ASSOCIATION

MAINE SEED IMPROVEMENT ASSOCIATION

AND

MAINE LIVE STOCK BREEDERS' ASSOCIATION

CITY HALL, LEWISTON

DECEMBER 6-10, 1915.

MONDAY EVENING, DECEMBER 6.

Meeting opened by Hon. W. T. Guptill, Commissioner of Agriculture. Invocation by Rev. S. A. Blaisdell, Lewiston.

ADDRESS OF WELCOME.

HON. LOUIS J. BRANN, Mayor.

It is with great pleasure that I welcome the Maine Dairymen's Association and the bodies with which it is allied, to Lewiston.

It is indeed an age of great education—an education that is being made each day by improved facilities, easier for the common, everyday man to obtain. It is an age also of highly specialized training, a greater efficiency and better understanding of the things about us. People are beginning to realize that the old-style method of doing business, raising crops and the other details of life, cannot be relied upon for results, and that the advancement of the times calls for efficient engineers, and so Farmers' Institutes and the establishment of trade and industrial schools at night for the wage earner have come into being. Men have begun to realize that a sort of teamwork, a sort of cooperation of one with another, a common sharing of trade secrets and methods in the final analysis, is bringing about a better condition of prosperity and a happier mode of life and, indeed, better business prospects.

The cave man, clothed in his rough garments, wielding his rough tools, fairly wrung from the soil his subsistence. His big fight was to survive, and his struggle for the necessities of life, that are ours today, practically, for the asking and taking, must have been to him despairing at times. When Earth began to respond to man's wooing, and he began to sense his birthright and heritage, it was through the fields, and as agriculture became his occupation, his lot became easier. He learned to know that, if he did not sow, there was no harvest to reap. This reduced, as centuries went on, his great problem of life, and he came to give his time and attention to the other things of life.

In this great country of ours, there is growing that idea of community help, trade betterment, and mutual understanding that makes for better business. You may be the most successful man in your neighborhood, yet some idea of a humbler brother might increase your own personal equipment. We who live in the cities are beginning to understand that our prosperity depends not exclusively on our own efforts, but we are successful just to the extent that other men are successful. We must work together harmoniously, with that spirit of kindness and friendship which brings the best results. So I hope that each brother here will go from this meeting, glad that he came —not only feeling that socially you have had a good time—I want you also to feel that you have carried from Lewiston and from this convention something of value to yourself and to the business which you represent.

It is needless for me to repeat that I am glad to welcome you here at this time. The city extends through me to you a most cordial welcome and greeting. Your convention is expected to be one of the best ever held in your history, and from the appearance of this hall, a large amount of time and pains have been expended to accomplish that end.

I heartily wish you success and prosperity, and hope that you will return to Lewiston at some future date, for another convention.

RESPONSE.

L. C. HOLSTON, Cornish.

It gives me, as ambassador of these three organizations, great pleasure to accept such a kindly and cordial welcome to this city. We have no home of our own where we can sit and discuss questions continually arising in this great field of agriculture, and it is well that such is the case. It is well that we have to accept the hospitality of our cities, our market places, that we may come into closer contact with the consumers of our products.

We hope that the meetings which are to be held this week in this hall will be as helpful to the consumer as to the producer and we want you all to feel welcome to attend any or all of them. One reason we come to the city, is in order to induce some of your best men, whom you have enticed from the old farms, to return and use their brains there, to our mutual advantage. There are lots of them longing to get into touch with the soil again. They long to use their hands as well as their brains, which is natural. They come to the city to do brain work, because all the farm demanded then was brawn and muscle. They called the work of the doctors brain work, when, as a matter of fact, in the best farming of today there is more chemistry, physiology, biology and hygiene than in medicine. Diagnosis of a sick soil and prescribing a remedy often requires brain work of the highest order.

They called the work of the lawyer brain work, when the laws of nature are quite as intricate as any made by man. They called the work of the bookkeeper brain work, when proper bookkeeping of the farmer is far more complex than that of almost any other business you might mention. Let them come back to teach our children, the hope of the country, not to be too hasty in giving up the farm environments for those of the city.

We have, as a people, spent much time and money in the past, trying to teach the farmer, with indifferent success. Work is now being done with the children, in Boys' and Girls' Clubs, and the success thus attained is little less than marvelous. Good work along these lines is being done in this state and is growing rapidly. At Presque Isle, Elmer Lovely made a profit of $509 on four acres, and Lee Shorey made a profit on one acre of $199.73, at a cost of 18 cents per bushel. Allow me to present a few examples of this work as carried on in different places throughout the country where these clubs have been formed. There are 1,200 boys in Ohio who raised the average of corn per acre from 35 to 81 bushels—a gain of twenty million dollars a year for their state. In 1910, Jerry Moore, of South Carolina, raised 228 bushels of corn to the acre, and in three years the corn crop of the state jumped from seventeen million to fifty million bushels. Fifty-two boys in Georgia in 1911 grew over 100 bushels to the acre. Twenty-one boys in Mississippi averaged 111 bushels per acre, against an average of the entire state of 19 bushels. Merle Hyer, of Utah, raised an equivalent of 797 bushels of corn to the acre in 1913. The year following, Howard Dolton, of Utah, was declared National Champion with a yield of 720 bushels to the acre.

The first champion girl tomato grower of the world was Katie Gunter, of South Carolina, with a record of 512 cans of tomatoes from one-tenth of an acre—a profit of over $60. In 1912, Fay Parker, of Arkansas, made a profit of $161. In 1913, Clyde Sullivan, of Georgia, made a profit of $132.39. In 1914, Hesta Sartain, of Alabama, made a profit of $146.20. From Texas comes the biggest winner of all, financially, for Texas is generous with appreciation for the work of her children. Louise Robinson, state champion for 1914, made a profit of $193 in the actual proceeds from her tomato patch and won prizes which brought her $496 in all, including a scholarship in Baylor Female College. Thirteen-years old Alice McCoy, of Louisiana, won over 184 competitors in a pig club, her pig weighing 500 pounds at 11 months old. She was offered $50 for the hog, and converted her father from being a poor cotton farmer to a pig raiser, and she won more money from her one pig than he did from his whole farm, including two mules, farm implements and a year's work. The

Baby Beef Clubs of boys and girls of Texas are now making thirty millions a year for their state. These clubs have brought success everywhere they have been started, and the bearing the work has upon the life of the youngsters is shown in the statement of one of the promoters:

"The boy begins to be proud of himself and of his accomplishments, in beating his father at growing corn. He combs his hair better and washes his face and hands cleaner. The neighborhood begins to talk about his corn. It is the center of attraction. He begins to feel his importance and says to himself, 'Here, I cannot afford to be at the foot of my class.' He catches new inspirations and directly is solving problems and analyzing sentences better than any other pupil in school. He cannot afford to misbehave and get the censure of his teacher. He begins to see some possibility of money-making in the soil. He begins to dream of the home he is going to build. He wakes up, he gets ideals and objectives. These clubs will increase the manhood and womanhood of any community where they are successful."

We need your aid to keep alive this great work, for it means as much to you as to us who till the soil.

THE OLD AND THE NEW.

DR. GEORGE C. CHASE, President, Bates College, Lewiston.

(Stenographic Report.)

It might be a question why the President of Bates College had been asked to speak in a convention of this kind. I might explain in a word that I owe the privilege and the courtesy to one of the officers, Mr. Blanchard, but am also glad and I rejoice to meet here as the presiding officer another man whom I knew very well at Bates College. Both Mr. Blanchard and Mr. Guptill are old students of mine, and I am glad to see them occupying these very honorable positions. I am especially glad to meet here in this hall another Bates graduate among the active competitors for a potato prize. I feel that our college is honored in the earnestness, efficiency and well-directed efforts of these men.

Had I been asked, 50 years ago, to say something about dairy and seed raising and cattle breeding, I might have answered very well for the time, for I was a farmer boy, and was familiar with all the processes of farming during the whole year; spring, with its planting and sowing, summer, with its cultivating and its haying, autumn, with its harvest and garnering, and the winter, with its cutting of the firewood, drawing it to the yard and preparing it for use. I knew the whole round, and regarded myself as rather an expert farmer. But, as I entered the hall tonight, my eye rested upon implements of which I should not have known the name had it not been for the card attached.

I remember the first mowing machine which came to our town, and how the farmers gathered from far and wide to watch it mowing, and the dismal prophecies they made about the probable success it could have. I remember the long winter evenings during which my father sat before the fire, shelling his corn in the old-fashioned way, by drawing it across a piece of iron set in a board, while I built cob houses on the floor. Everything is changed. In no department of human effort has the old given place to the new more than it has in the department of agriculture. When I was a young farmer, we heard nothing of commercial dairying, commercial plant breeding or cattle breeding; now we have our agricultural colleges and we find every new subject of any account given a column or more than a column in every newspaper, whole pages devoted to farm news, and we have a great department of our government represented by a man who sits in the cabinet, the Secretary of Agriculture. Everywhere there is an awakening to the importance of agriculture, and it is well, for it is the noblest, the most fruitful, the most honorable, the most useful to man, and it has always been regarded as an honor to be a successful one.

George Washington in his first address to Congress recommended the establishment of an agricultural department. Later the recommendation was renewed in 1817 by another president, and was almost unanimously voted down, in an age when farming predominated, and was better represented in legislative halls than any other body. George Washington and Benjamin Franklin were members of the first agricultural association in this country. Abraham Lincoln, our great president, found it of advantage to foster the interests of agriculture. It was during his administration, as we all know, that the famous "Mill Act" was passed, which has given us our agricultural colleges, including the department at our own University. It was during his administration that a Bureau of Agriculture was established. Subsequently in the administration of President Cleveland agriculture rose to an equal position with the other departments of the government.

All these changes are exceedingly gratifying, and yet, on the whole, what are our gains and our losses? From the country during the earlier years of our history and later down to the present time, we have been deriving the strength of the nation, the physical strength, the health, the brain as well as the brawn that developed our industries and furnished a leadership in all the affairs of our country. Nine-tenths of all the great men of our country, acknowledged to be the great leaders, have had actual contact with the soil as workers. Will this continue?

We cannot tell. Relatively, as we all know, the farm population is rapidly declining in numbers. Now only a little more than half of our population is called rural. Nearly one-half of that is now called urban. If we should include with the urban what might properly be included, many large villages, the census of rural population would be very much diminished. We are in positive danger of losing in so large a measure the great source of physical and mental strength, the great source from which we have derived our leaders.

I rejoice in all the evidences that we find on every hand, that we see here in this hall, that are disclosed to us when we open a newspaper, in the increasing number of agricultural courses in the public schools, I rejoice in all these, and yet are there not some losses against which we should guard? The very hardships, the very toils and difficulties developed something in us of incomparable value to our country. When I was a boy, everybody of ten years of age and upwards was up at 5 o'clock in the cold winter mornings, and busy with chores, and in the summer everybody was up at 4 o'clock in the morning. I know these things from actual experience, and they were hardships. Then the absence of those and tools and appliances which represent so much ingenuity and save so much toil, the absence of these had some advantages for the farm boy of 50, 40 or even 30 years ago, for they were obliged to rely upon their own resources, they were obliged to cultivate persistence, well-directed, thoughtful effort that we are in danger of losing in these really better days. Let us keep all that we have, and in some way take care that we lose none of these precious elements of physical and mental strength, the power to do and achieve. Such power as was manifested by the boys and men of our country during the Civil war, whenever it was necessary for some active brain to discover some method of building a bridge or cutting a way through the forest, they welcomed the farmer who was equal to the emergency.

Let us hope that our colleges and our schools will develop the practical side of our lives, and powers of our boys and our girls. I was exceedingly interested in the account in the response to the address of welcome of what has been achieved by the boys and girls of our country. There is a tendency to the easy life. Ten years ago I rode through one of the best farming sections in Maine. It was an old section, very early settled. As I glanced this way and that at the beautiful houses and fruitful fields, I would ask, "Who lives here?" and the driver who seemed to be a very well informed man, would tell me, "Mr. So and So lives here," etc., and I asked about their children, and I was amazed, I was astonished, that in three cases out of four the children had left the farm, or were living there as idlers. Those farmers in that section had become what we call comfortably well-off, were able to hire help to do their work, and were allowing their children to live in idleness and luxury. Against these losses we must contend, and it is not for me to say in this brief time how we are to do it.

If you have not had any opportunity to read an article entitled "The Organization of a Rural Community," published in the 1914 volume of the Report of the Agricultural Department at Washington, by T. N. Carver, in which he very minutely and wisely outlines the methods of organizing rural communities, please do so at your first opportunity. I believe this plan to be very practical, and that it may be realized. The farmers are getting the results of the inventive genius of our people. It is manifest wherever we go. They have not yet learned, as I think they will, to follow the principles of modern economic science, of cooperation in producing, cooperation in marketing, cooperation in purchasing, cooperation in the promotion of wise and healthful recreation for the boys and girls in the community, cooperation in the beautifying of the exterior and interior of their homes. I believe these things are to come; they are absolutely necessary for the precious results of which the speaker who gave the response spoke; for these to be accomplished, we must bring about a cooperation in these things that will render country life more attractive than it is now. I remember when I was a boy, the old Lyceum, which set the brains of the young men and women to work; I remember the debates and literary exercises, rather crude, to be sure, but bringing out the young men and young women in a way to develop them. No doubt many of them were very wisely and effectively administered.

I think the Boy Scout movement and the Campfire Girls movement, the movement to organize the women in our country towns to study, the promotion of clubs which deal with the beauty of the country, and cultivate the artistic sense, are of great value; I hope these will multiply. Let me express another hope. When I was a boy and went to the little church opposite my father's house every Sunday, it was crowded, and the horse sheds on either side of the little church, with many places for horses and carriages, did not contain room enough for the people who came with teams, and the church in those days was itself a social center, the source of power, bringing men and women together in pursuit of the highest interests and the highest of all, the religious interest. I hope there must be higher social, useful and religious life among our farmers. I would speak of this thing, not in a patronizing way, but my heart is sad when I go back to the old place, and sit in the old pew, and see not more than thirty or forty where two hundred used to come. I trust it is not out of place, in this convention of dairymen of the State of Maine and cattle breeding, to speak of these things. They naturally come to my mind by reason of my occupation and my association with young people.

We all love the soil, we all came from it, we all at least return to it, and so long as we come into contact with the soil, we shall preserve some of the purest, finest, most auspicious elements in our natures.

You may have read the old fable, of Antaeus who wrestled with every stranger who came into his country, who compelled every stranger to wrestle with him, and every time he brought the opponent to the ground, until it was found that he had an invisible contact with the ground which gave him strength. Hercules came along, found out the secret, lifted him from the ground and conquered him. There is a great truth in this fable. Let us keep to the soil. I find that our great leaders and statesmen rejoiced to go back into the country. It is a most healthy instinct, and unhappy is the man or woman who cannot in some degree gratify it. With heart and hand I congratulate you, and wish to cooperate with the farmers, the men who are working for the elevation, not only of the agricultural interests, but of these men and women upon whom our country depends for its existence. I would do all I could to promote the agricultural interests, and to add strength, cheer and joy to the life of the farmer.

Let me add: At Bates College, very often the farm boy and girl come in without having had the very best opportunities by way of preparation, but in the course of a year or two, they stand at the head of the class. We had, one year, a country boy whose opportunities had been far from good, but at the end of the first year he came out with the highest rank of his class.

BACTERIA CONTENT AS A FACTOR IN DETERMINING THE MARKET VALUE AND HEALTHFULNESS OF MILK.

HERMANN C. LYTHGOE, Director, Division of Foods and Drugs,

Massachusetts State Department of Health.

Bacteria are microscopic plants which reproduce themselves by splitting up into two or more bacteria, if they are provided with suitable food. Milk at the point of secretion in the mammary glands is sterile—that is to say, it contains no bacteria, but it always contains bacteria when drawn, even if this is done under the most careful conditions. The greater number of bacteria in milk are obtained from the hands and clothing of the milker, from the dirt, hairs, etc., falling from the cows into the milk, and from the dirty utensils with which the milk may come in contact. If the udder of the cow is diseased, bacteria are liable to invade the milk and, in some instances, these bacteria are capable of producing severe sickness among people who drink the milk. Milk is an ideal food for bacteria, as well as for men and animals, and the growth of bacteria causes certain chemical changes to take place in the milk, of which souring is an example. In general, the chemical changes taking place in milk, due to the growth of bacteria, are harmless, but, occasionally, very poisonous by-products of fermentation can be produced. This is a very unusual occurrence, fortunately, for when it does occur the milk gives no indication of its nature by sight, odor, or taste. It is desirable to keep out of the milk as many bacteria as possible, and to stop the growth of those which may get into the milk, by keeping down the temperature. Like most plants these bacteria grow best in a warm climate and do not enjoy the frosts. If the milk from a diseased udder, or milk contaminated with the bacillus of typhoid fever or with disease germs which may grow in milk, is mixed with other milk, all the milk of the mixture is liable to be contaminated by the growth of the bacteria. This is in contradistinction to adulterated milk as the more pure milk added to the adulterated sample the lower becomes a percentage of the adulterant. If milk is added to water in increasing quantities the time will come when the water is drowned by the milk.

When one is dealing with a small community, where most people either keep a cow or buy milk from a nearby neighbor, the milk problem is not a burden upon the community, but when communities become congested and cows no longer occupy their places in the former back pastures the people are forced to go elsewhere for their milk and every man ceases to be his own milkman. It is under these latter conditions that the bacteria content of milk is a question to be considered by the community, owing to the ensuing commercialism of milk.

Many cities in the United States, particularly the cities and towns in Massachusetts, which consume so much milk produced in Maine, New Hampshire and Vermont, have passed local regulations prohibiting the sale of milk of high bacteria content. In order to comply with these regulations the milk dealer is forced to resort to pasteurization, if his route is large enough to warrant the expense, or, if not, to carefully select his dairies, giving preference to those producing milk of a low bacteria content, and, in general, these must be located in towns near the place of consumption.

The dealer who pasteurizes his milk, with proper apparatus, may produce a product low in bacteria from raw material high in bacteria, provided that the samples are not sour enough to coagulate or curdle upon heating. He may buy milk high in bacteria, mix it with milk low in bacteria, clarify, and pasteurize the mixture and thereby produce a resulting product low in bacteria. This procedure gives no incentive to the farmer to produce a clean product, but, if the farmer is to be encouraged in his production of clean milk, he must be paid proportionately more for it. This does not seem to be possible under our present commercial system of milk distribution, as it is not a commercial necessity on the part of the dealer to obtain clean milk low in bacteria, if the product is to be pasteurized.

Milk is produced by the farmer and is, to a large measure, consumed by the inhabitants of the cities. It has been said that this age is fast becoming the age of the consumer. While this statement may not be true of all commodities, it is beginning to be true of milk, and the consumer is now demanding that the milk left at his door must be of low bacteria content and must be obtained from healthy cattle, kept in sanitary dairies. It is for this reason that the milk inspectors from Massachusetts cities and towns are visiting your state and inspecting the premises upon which milk for the Massachusetts market is produced. The law under which so many local boards of health are inspecting our dairies is far reaching in its action, and its entire possibilities have not yet been realized by these boards. At present, they are paying most attention to the scoring of the dairies, using a minimum score on the United States dairy score card as the requirements for the admission of the milk to Massachusetts cities or towns. but the possibilities of the law may be realized and bacteria limitations may be required before the dairymen can furnish to the wholesale or to the retail dealer. These local boards have, in many instances, made bacteriological standards, above which the sale of milk in their respective cities and towns is prohibited. It seems desirable, however, that the bacteriological standards for milk should be made by statute rather than by regulations, or, they should be made and enforced by one central authority, owing to the varied character of the regulations and the different methods of enforcement under the present conditions.

There are harmful and harmless bacteria and fortunately the former are not usually present in milk, otherwise our death rate would be enormously high. It is a comparatively simple matter to determine the total number of bacteria in milk, but to separate and identify the number and character of each class of bacteria present would be interminable and in many instances impossible. It is a very simple matter to drop a needle in a haystack, but finding the same needle is a matter of great difficulty, although the entire quantity of hay, plus needle, can be easily estimated. The character of these different bacteria are determined by the peculiarities of their growth upon different media, and some are capable of being recognized by their microscopic appearance. It is a difficult matter to recognize a few weed seeds in your hay or clover seed, until they have been planted and the character of the growth determined, but the presence of such seeds as corn or beans could be easily detected by observation.

For the detection of tubercle bacilli in milk, six weeks is necessary. Typhoid and diphtheria bacilli can be detected in four or five days and for the determination of the relative virulence of streptococci two or three days is necessary. The enormous expense of carrying on routine work of this nature makes it prohibitive, and for this reason regulations relating to bacteria in milk refer to total numbers rather than to the quantity of the specific bacteria which may cause sickness to the people using the milk.

Bacteria are present in milk as a suspension and this suspension is not always uniform. For this reason analyses should be made from several samples and the results reported as averages of all determinations. Final conclusions should be drawn only after a series of examinations. Comparisons are of moment only when the numbers are greatly divergent, thus the difference between 50,000 and 55,000 bacteria may be due to differences in sampling or in methods of estimations, but differences between 50,000 and 500,000 bacteria show conclusively that the articles were produced and kept under vastly different conditions.

New York City has established a milk grading system which seems to put a premium on milk of low bacteria content. The merits of this system can be enjoyed by the farmer as well as the consumer. This system, which can be easily controlled when dealing with a congested population, prohibits the sale of raw milk unless of a quality resembling certified milk. Under this regulation the producer of this grade milk most certainly must be well paid for the product. This milk must be obtained from tuberculin tested cattle which are housed in stables of a minimum score on the special score card of the New York City Health Department, and the bacteria content must be below a certain fixed maximum when delivered to the consumer. All other milk must be pasteurized, and, if the bacteria content of the raw milk is above a certain fixed maximum, the milk cannot be pasteurized and sold unless labeled "Grade C, for Cooking Purposes Only." In order to avoid the alternative of marking his milk in this manner the dealer must select dairies supplying milk of low bacteria content. This brings the dealers into competition with each other in the buying territory, which does not occur under the system of milk distribution in New England, and this competition is further emphasized by the establishment of two grades of pasteurized milk—Grade A, Pasteurized, and Grade B, Pasteurized, which may be sold without the damaging label required upon Grade C. Grade A, Pasteurized, is obtained from better stables and must have a lower bacteria content before pasteurizing than Grade B. Reports received from the New York City Department of Health and from the milk dealers of New York City indicate that the demand for the higher priced milk, Grade A, Pasteurized, is increasing. In order to meet this demand the dealers must pay a higher price for a better grade of raw milk and the dairymen supplying New York City are said to be striving to better their products in order to obtain the higher price.

When milk is purchased at a flat rate per quart, the farmers who have the dirtiest stables and the cows which give the largest amount of milk are liable to fix the price of milk, because they can sell cheaper than those who produce high grade milk in clean stables. You should insist that milk produced under sanitary conditions should receive a higher price and should not be mixed with dirty milk. This can be accomplished by rigidly enforcing dairy inspection, which may bring some individual hardships at first but which will eventually be of ultimate value to all. If dealers, however, are permitted to buy milk from dirty stables and from dirty dairymen, the milk should be kept separate and should be sold bearing a label stating that it should not be eaten until cooked.

The grading of milk will some day be realized, and, if the right system is adopted, it will, undoubtedly, be of benefit to the producer as well as to the consumer. The consumer should pay a fair price for a good grade of milk, but the producer should also be paid a fair price for a high grade of milk. When this is done, the milk problem will have advanced one step nearer its final solution.

MILK AND ITS RELATION TO HUMAN HEALTH AND DISEASE.

By EUGENE R. KELLEY, M. D., Director, Division of Communicable Diseases, Massachusetts State Department of Health.

My talk today will be simply a bird's-eye view of the subject of milk and its relation to the public health.

This is a side of the question in which the producer needs all the enlightenment he can get. It is, however, equally true that the consumer, the laboratory investigators, and health and food officials need enlightenment in regard to the financial burden of the producers' problems fully as much.

Let us discuss the question of milk and its relation to the public health under two broad divisions—Why is milk a public health problem? and, How is milk a public health problem?

Milk is a public health problem to an extent not approached by any other food product for several fundamental reasons. The first reason why milk is a public health problem is because milk and its derivatives, cream, cheese, ice cream, etc., is almost the only animal product that is habitually consumed in large quantities in a raw and uncooked state.

In the second place, milk is a fundamental public health problem because milk is consumed to the greatest extent as a food or beverage by that portion of humanity that is most easily susceptible to the ill effects of impure or dangerous food. I refer, of course, to infants and children. This is the reason beyond all others that makes the milk question a vital public health problem.

Milk in some form or other is a vital necessity to mankind for the first year of life, and almost equally as necessary for the second year, although it is true that some races, as the Japanese, do not use cow's milk or other animal's milk at all. Yet the Caucasian race seems to be firmly wedded to cow's milk as a food for infants, either after a child has been weaned from mother's milk, or, as is the case in a too rapidly increasing proportion of the infants of today, from the very first weeks of life.

This increasing dependence upon cow's milk for very young infants is a grave medical, social, and public health problem. Very often you will hear statements credited to medical men and others, alleging that the entire reason for this decreasing use of mother's milk as the source of nutriment for young infants is selfishness and disinclination on the part of American women to carry out the nursing function. While not denying that many instances can be found where sheer laziness or selfishness has been at the basis of premature weaning, I cannot agree that this is the fact in all cases, or even in the greater portion of the cases.

I think the truth is that the ability to furnish mother's milk, especially among our native born mothers and still more among *city* mothers of native American stock, is steadily diminishing. I feel positive that the greatest reason is that many mothers *do not have the milk* to furnish the child, much as they would prefer to nurse their children if able to do so.

If this is a fact, it only means that there is still greater reason why increasing care must be paid to the quality of our general market milk, especially in cities, for in many, many instances the infant's struggle for existence must be determined solely by the quality of the milk that can be obtained in open market. It does not matter how successfully milk is modified or diluted or how scientifically the hours of feeding are adjusted, if the quality of the only milk available at the outset is bad, the final result can be nothing save disastrous to the infantile life of the community. Another reason why milk is a public health problem is because milk will decompose more quickly than any of the other commonly used foods. It is true that in most instances the type of decomposition that takes place in milk is the natural lactic acid fermentation or souring. This is a process which is not injurious in itself, as has been quite thoroughly proven of late years by the widespread vogue of sour milk and lactic acid in treatment of cases of indigestion; but the fact remains that sour milk is distasteful to most people and especially to young children, and undoubtedly nature intends that souring of milk shall be a danger signal. But experience has shown that, not infrequently, if milk is produced under insanitary conditions and not properly protected against the action of putrefactive bacteria, very grave putrefying processes may at least be begun before the milk becomes so sour as to attract notice. Translated into practical terms this means that, when such milk is fed to young infants, the flavor and taste may appear all right but yet the milk be changed for the worse to a sufficient extent to induce very serious infantile intestinal disorders.

Another reason why milk is a serious public health problem is because milk is almost unique among foods in being an excellent culture media for bacteria in the same form in which it is usually consumed.

Still another reason—and one that is often overlooked—why milk is a public health problem is that milk is not transparent, hence, by the sense of sight it is practically impossible for one to realize how dirty milk may be without producing any visible manifestations. If milk were as transparent as water the overwhelming force of public opinion would have settled the question of gross manure pollution, etc., years before the sanitarian came upon the field to point out the serious menace to public health from simply dirty milk.

And, lastly, the production and handling of milk is a serious public health problem because milk is the hardest of all foods to obtain, transport and deliver in a clean, fresh and sanitary condition, and to accomplish these results unusual thoroughness, care and skilled supervision must all come into play. These are some of the reasons *why* milk is a public health problem.

We will now consider *how* milk directly affects the public health. In a general sense it is easy to see that it is possible for milk to affect the public health in four ways:

First, by transmitting diseased conditions already existing in the cow.

Second, milk can directly affect the public health from the inherently bad quality of the milk itself without necessarily transmitting any specific disease.

Third, milk can and does affect the public health adversely by serving as the transmitting medium through which infectious diseases peculiar to mankind alone are carried from one person to another.

Fourth, milk, more than any single article of diet, constantly helps to sustain human life and, owing to certain peculiar qualities of milk as a food, it is safe to say that among young infants and invalid adults milk in thousands of instances every year in the United States saves human lives that otherwise must have been lost.

I. TRANSMISSION OF DISEASES OF THE COW TO HUMAN BEINGS.

For practical purposes the only disease that deserves our consideration under this subject is that of bovine tuberculosis. In times past there has been an enormous amount of controversy and investigation over the question of whether or not bovine tuberculosis could be transmitted to and produce the disease tuberculosis in human beings. As a result of all this work and investigation certain statements can now be made with a much greater degree of certainty than was the case a few years ago. The facts now seem to indicate that bovine tuberculosis is transmitted to human beings almost exclusively in the first few years of life and is transmitted directly through cow's milk, although it is equally possible for it to be transmitted by ice cream or butter.

It is now estimated that perhaps seven per cent of tuberculosis in human beings is of bovine origin. For children under five years the best estimates are in the neighborhood of thirty-three per cent. It is also believed that for the most part the bovine or cattle variety of tuberculosis manifests itself in the human race as the non-pulmonary types of tuberculosis; that is to say, tuberculosis of the bones, joints and internal organs, including tubercular meningitis. Hence, it would seem probable that whenever there is an increase in cattle tuberculosis there must be an increase in these forms of human tuberculosis other than consumption.

It is not within my province to go into the question or thoroughly discuss the great economic loss to the dairy interests itself from bovine tuberculosis in dairy herds.

2. HOW DIRTY MILK AFFECTS THE PUBLIC HEALTH.

Broadly speaking, dirty milk affects the public health principally by producing very serious and fatal diarrhea and dysentery in young children. In many instances it is doubtless true that a specific germ of dysentery can be detected, but I believe firmly that we do not need necessarily to find specific dysentery germs in milk to have milk produce most serious cases of dysentery in young children. I believe that dirty milk—just plain dirty milk—will produce serious and fatal cases of dysentery and diarrhea in young infants. It is true that whenever milk deserves to be classed as "dirty milk," the bacterial count will always be high. It seems to me reasonable to assume that a large quantity of these germs, which are not ordinarily considered as disease germs, and more particularly the products of their growth of the so-called toxins existing in the milk, are enough in themselves to produce these serious indigestions, diarrheas and slow starvation from lack of assimilation of milk by infants. One of the best authorities in the United States on infantile diseases makes the following emphatic statement on this point:

"I believe that the greatest injury is done by just *dirty* milk, not necessarily infected milk in the warm season when bacterial growth is the most favorable. Dirty milk may not be poisonous to infants but it is very apt to be so."

One argument that we often hear advanced against this belief that dirty milk itself will produce serious disorders is that farmers' children on the farm drink this same identical milk and that they thrive upon it. This is true, but the fallacy in this line of argument lies just here: Milk when first drawn, even if done under very careless sanitary surroundings, contains relatively few germs of any character. It is the long period of time that must of necessity elapse between the time when the milk is milked and when it reaches the ultimate consumer—that is, the city infant—that allows bacterial growth to make such rapid headway and changes the milk from a food that is wholesome for farmers' children, and which they drink and thrive upon, to an unwholesome food which the city infant drinks and dies from as a result.

3. TRANSMISSION OF DISEASES PECULIAR TO MAN THROUGH ACCIDENTAL INFECTION OF MILK.

Another way in which milk produces diseases in man is by conveying specific infectious diseases. This is peculiarly true in the case of older children and adults, inasmuch as very young infants fortunately seem to have a very high natural degree of immunity against the most common infectious diseases—an immunity very rapidly lost after the first year of life.

Tuberculosis is the specific disease most commonly transmitted by milk, but because this disease is derived from the animal we have considered it a separate problem. The common point about all the rest of these diseases is that they are *not* due in any sense to the condition of the cow that produced the milk, but are due entirely to human contact infection at the time or after milking is done, that is, between the time when the milk leaves the cow and the time when it is swallowed by the consumer.

These facts about the transmission of infectious diseases through milk are a comparatively recent discovery. Statistics on these points go back only comparatively few years, but when the facts are brought together they make a most powerful indictment, not against milk itself, but against careless methods of producing and handling milk. Milk, as a rule, becomes infected with the germs of specific infectious diseases on the farm or in the dairy premises, or in process of transportation, and not readily after its final arrival in the household. These serious possibilities of milk infection are due to milk's peculiar qualities as a germ food, and, hence its power of multiplying the original amount of infection many times during the period that the milk is being transmitted from producer to consumer unless kept cold, when such multiplication does not occur.

The total number of infectious diseases that may be transmitted by milk is quite large, but for practical purposes we may consider four. They are typhoid, diphtheria, scarlet fever, and so called epidemic sore throat.

The chief characteristics of transmission of contagious disease through milk, are:

First, epidemics produced by them are practically explosive in character in the suddenness of their onset.

Second, when investigated they will always show a striking peculiarity of distribution along certain milk routes confined entirely to milk consumers.

Third, that primary milk products which are made without processes of heating to a high temperature, as cream, cheese, butter, ice cream, etc., may transmit diseases in exactly the same way as the milk from which they originally came.

Fourth, another general characteristic of milk borne epidemics is the fact that infection may come not infrequently from the original milker to the home in which the milk is finally consumed.

(a) *Typhoid.* There are many clear cut illustrations of transmission of typhoid by milk. Milk is particularly apt to be infected with typhoid by chronic typhoid carriers engaging in the milk business. Milk may swarm with typhoid fever germs without being altered in the least in taste, odor or appearance. In one instance, near Boston, 410 cases came from infection of milk by one person. It is important to prove that milk is actually, not simply apparently, the cause before definitely condemning the milk supply. Proof means recovering the germs from the human carrier. We have done this twice in relatively small epidemics in the past few months in the laboratory of the State Health Department of Massachusetts.

(b) *Diphtheria.* Like typhoid, the fact that diphtheria germs could be transmitted through milk is of comparatively recent recognition. Unlike typhoid, diphtheria bacteria do not grow readily in ordinary milk and correspondingly the number of milk borne diphtheria epidemics would seem to be very much less than those of typhoid fever or even scarlet fever. Diphtheria is a disease more acute than typhoid and better quarantined. Widespread use of antitoxin tends to destroy the bacilli in the earlier stages, and also from the fact that this disease is spread by the mouth and nasal passages only, it is not so apt to get on the hands from the mouth as are typhoid bacilli, which are spread through the urine and fecal discharges.

(c) *Scarlet Fever.* We do not yet know the exact cause of scarlet fever but know that it is without question a disease spread by a germ or a virus. In all probability the principal channel of infection of scarlet fever is by germs thrown off from nose or mouth cavity. It is now held to be rather doubtful if the scales which come off the body during the peeling process are at all infective. At any rate, the germs of scarlet fever whatever their nature can be transmitted by milk and epidemics from this cause may be extensive and fatal. Very mild cases of scarlet fever, especially in adults, are apt to go undetected and after two or three days' transitory illness the patient will often feel well enough to resume work while really in a most infective stage of the disease. This is another reason why scarlet fever milk-borne epidemics are probably more frequent and of greater magnitude than those of diphtheria, which is more truly a children's disease, although adults may have them both.

In the spring of 1910 in Boston, 842 cases of scarlet fever were reported in a short time, several cases being fatal. Investigation proved that all the cases came down between April 27 and May 5—nine days in all. Further investigation proved that the great majority of cases reported in this period were on routes of one milk dealer who had several routes. Following pasteurization of his milk the epidemic suddenly ceased. Although the exact source could never be determined, it is clear that the original cause of all these cases must have been an unrecognized case or cases on one or more of the farms producing milk for this dairy. In many other instances smaller epidemics have been traced back to the identical individual responsible—sometimes proving to be a person employed on the farm, sometimes a person employed at the dairy or bottling plant.

(d) *Septic Sore Throat.* Septic Sore Throat is a disease whose epidemic nature has just begun to be well appreciated in the United States although well known in England for many years. Whether we have only recently had the disease imported, or whether we have failed to distinguish and to appreciate its essentially milk-borne nature as contrasted with other milder epidemics of tonsilitis, is an unsettled question. It is possible that like tuberculosis septic infection of the cow's udders may transmit the disease, although it is believed that the so-called streptococcic germs that produce it usually get into the milk from human sources. At any rate, it has certain very striking features. These are:

(1) The epidemic can *always* be traced to a common milk supply as the source.

(2) It does not seem to spread readily from person to person but principally, perhaps exclusively, through the milk.

(3) It is very fatal to aged people.

(4) It is very seldom fatal to children, but

(5) Produces in them an unusually high percentage of serious complications, such as ear diseases, abscesses, heart disease, peritonitis, erysipelas, joint or rheumatic involvement, pneumonia, acute Bright's disease—one or other, sometimes several of these, occurring in over 25 per cent of the cases.

The septic germ, the streptococcus, can usually be found in the milk and in the throats of the sick quite readily. In Boston an epidemic of 2,064 cases was traced to one of the model dairies of New England which for 25 years had enjoyed a high reputation for its sanitary standard.

The facts in regard to septic sore throat teach us more than anything else that all *raw* milk may be *dangerous* milk.

(e) Minor diseases spread by milk.

Worthy of passing notice under this head are:

(1) *The milk sickness or "trembles,"* a disease almost extinct now but which prevailed widely in Central States in pioneer days, and which disappeared as forests were cleared and pastures fenced. Little is known of its real cause but it is known to have been produced by using milk and butter from herds which were affected with the "trembles." It was very fatal; Nancy Hanks, the mother of Lincoln, died from it. It has recently been proved to be due to a specific bacillus.

(2) *The Foot and Mouth Disease.* This also is primarily a disease of cattle and is very destructive to herds—from economic reasons, not from high animal fatality—but is seldom fatal to human beings.

(3) *Garget Diarrhea.* The fact that milk from cows suffering with garget will produce diarrhea if used by man is so well known as to need almost no comment. It is practically never fatal.

(4) *Malta Fever.* An interesting disease is Malta Fever, which is primarily a disease of goats but readily transmitted to man by drinking infected goat's milk. In some parts of Europe it is a serious public health problem but not in this country.

THE FOOD VALUE OF MILK.

This aspect of the relation of milk to human health is a particularly pleasant one to touch upon. It represents the health and life sustaining properties of cow's milk as an everyday article of diet.

Perhaps the most unfortunate thing about the entire literature of milk and the present agitation relative to the use of cow's milk throughout the country is the slight amount of emphasis that has been placed on the *value* of milk as contrasted to the dangers of milk as an everyday article of human diet.

Milk as an incubator of infections, the limitations of the cow as a substitute for the human mother, the connection between dirty, stale and decomposed cow's milk and the summer scourge of the innocents—all these themes have been worn threadbare, all have been argued to the point of exhaustion and all more or less conclusively proved. But the beneficent role played by the maligned cow even under the most adverse conditions, in stepping into the breach between life and death when mothers fail, has received all too scanty emphasis.

It may even be seriously questioned whether some of the well intentioned popular agitations, relative to the disease-bearing possibilities of milk, have done as much *service* to the cause of humanity, by pointing out the existence and insisting upon the correcting of certain very real and serious dangers, as they have done injury to that cause by inducing an exaggerated fear of cow's milk as it is produced and handled at present. This fear, in turn, has led to attempts to substitute for cow's milk other materials and products that in the long run are vastly more inimical to human health in general and to that portion of humanity designated as infancy in particular.

It may be held that such statements as the foregoing are damaging to the "clean and safe milk" cause, that any responsible officials making such statements are placing themselves in the position of apologists for the cause of dirty and disease producing milk. Far from it. Such statements simply indicate that the other side of the problem should receive its fair consideration.

Exaggeration of the dangers of milk as they *are,* an insistence upon nonessential, whimsical, illogical, and excessively costly measures of alleged protection of the consumer's milk, *at the present,* are never going to successfully solve the problem of safe, clean and honest milk for the consumers *in the future.*

The universal use of milk as an ingredient of a large proportion of the products of the kitchen has perhaps made us lose sight of its prime individual value as a complete food in itself, of the fact that it is the only single article of our foodstuffs which is so constituted, and is in itself so balanced and complete a ration, that human life can be sustained on it alone for a long period.

Cow's milk and mother's milk are nearly enough alike in the proportion of their various constituents so that by simple means, so simple that a person of average mentality can understand and carry them out, cow's milk can be made a sufficiently digestible food for the average infant. This is particularly true in cases where the mother has been able to nurse her child long enough to get him at least well started in life.

Faulty methods of production, distribution, and especially faulty methods of receiving and caring for the milk at the home give opportunities for pollution of and consequent changes in the food value of milk.

It is not fair, however, to continually place the fault of all the bad qualities of milk upon the producer and dealer. The unbiased testimony of the best authorities in the country is practically a unit in declaring that certainly over fifty per cent of the well demonstrated evils of milk should be justly charged to thoughtless, careless or almost criminally ignorant methods of caring for milk in the home.

CONCLUSIONS.

There are several possible ways of solving the health aspects of the milk problem.

One answer is Japan's—stop using cow's milk. This is never going to be the solution in America.

Another answer is: Have milk produced from absolutely healthy cows in so clean a manner and transported and delivered in such a sanitary manner as to keep out all infection. This is one ideal that should always be aimed at but practically is impossible of absolute fulfilment.

As far as tuberculosis is concerned, the economic gain to the dairy industry by eradicating bovine tuberculosis is going to be so great that I, for one, am confident that within the next generation or two the dairymen themselves are going to solve this question by eradicating the disease from American herds.

The most practical answer to the general problem now seems to be: Produce milk as clean as possible to protect infants from infantile diarrhea due to filth in milk, then pasteurize it properly, i. e., under official supervision, to kill the human disease germs that otherwise are always liable to get into milk by accident. Pasteurization saves lives and therefore this is an extremely important question.

Another practical and possible procedure along this same line is extension of sanitary supervision as to health of employees in the dairy industry by the health authorities.

Another practical step is segregation of milk according to different grades, with a higher price for guaranteed milk. Then, customers when buying inferior, dirty milk, and, hence, possibly dangerous milk, must do so with their eyes open.

Scaring people by foolish and unfair statements on the part of health authorities will never solve the milk problem. The milk industry is a great industry—it is a great public health problem as well. The dairy producer is entitled to a square deal as, after all, milk with all its faults is the greatest and most useful of foods and returns the greatest amount of food value at the lowest price, and greater use of milk should be encouraged.

DISCUSSION.

L. C. HOLSTON, Leader.

MR. HOLSTON: I am sorry that I am called to open this discussion as a producer of milk. I feel that I have no reason to get up and discuss these questions which have been brought forth by these men who have been trained in their special lines of work. I feel that a few questions may bring out something on the subject of bacteria and all that sort of thing for our good; possibly for the plain man more than for the bacteriologist. We have been hearing about bacteria, harmful and harmless, but very little about beneficial bacteria. In fact, the subject of beneficial bacteria has never been brought up.

MEMBER: The condition of our milk, as we deliver it, has been examined by the customer in our section of the country, by picking up the bottle and looking for the cream on it, to show whether it is good milk. People who use this milk have not yet been trained to find bacteria, and we have to take that into consideration. The cream line is all that is taken into consideration by the present consumer.

MEMBER: Is there more danger in using pasteurized milk kept for a long time, than raw milk, as it comes from the cow? Perhaps a good many of these questions are foolish, but they are questions that are continually arising in the minds of farmers. We do not know much about bacteriology, but we are willing to learn. We have come here for that purpose.

MR. KELLEY: Bacteriology is not as bad as it sounds. It has been some years since I have done laboratory work. I have never been classed as a full-fledged bacteriologist, but have studied about it. If Dr. North feels inclined to take issue on what I shall state I believe, I shall be glad to have him do so. The question was asked, what is a beneficial bacteria in milk? The souring of milk in a natural way is where bacterial benefits come in. I fail to see why, if milk could be kept just as it is produced, when it is thoroughly sterile, why it should not remain so. There is a psycho-therapeutic theory that sour milk won't hurt you unless you expect it to. I believe it myself.

MEMBER: Suppose that a man who is sending his milk to the shipping station has a cow that is not well in every respect, and the owner keeps sending out milk from this cow. Lots of people will keep putting the milk out just as long as they can get any milk from the sick cow. I know a man who looks out for the milk for his own use, and sends the rest to the city. We must figure on the percentage of loss to the farmer who does not send out the diseased milk. Many of us will be honest, if we are paid to be honest. Sometimes we think the other fellow will be the other way.

MEMBER: Some prepare the milk by pasteurizing it upon the farm. Is it better to do that, or wait until it goes to the distributing station and be pasteurized there?

MEMBER: I am from Missouri; I have to be shown. I think the method of pasteurizing milk on the farm is the ideal one. Practically, it cannot be done. We are trying now to determine what is the minimum supply which can be profitably pasteurized on the farm. The expense prohibits pasteurizing of small quantities. As to diseased milk, if a cow has tuberculosis, she should not be kept.

MEMBER: Is there more danger from consuming pasteurized milk that has been kept too long, or raw milk that has been kept too long?

MEMBER: In Europe they cook the milk, and it does not seem to hurt it a bit. There has been an attempt to prove that cooked milk hurts the individual, but, personally, I think it is all right, only I do not like the taste of it. The process of pasteurization was invented to keep wine in France, to kill all the disease-bearing germs. A temperature of 145 degrees maintained for 30 minutes, will destroy all germs. Anything that goes into the milk after pasteurization makes it possible for trouble again.

MR. BRADFORD: The question whether milk naturally would be kept longer if pasteurized, and if in so keeping the results would be injurious to the consumer, is in my mind a good deal of the time. I inferred from the gentleman who asked the question that he objected to the long keeping; certainly, our Commissioner of Agriculture gave a tremendous slap at keeping milk 72 hours and then 72 hours again. There is a vast fluctuation or variation in the consumption of milk. In cool, rainy weather, people do not think much about drinking milk, and when it comes off hot and dry, people drink more cold milk. Sometimes, for a week or ten days, the consumption of milk is very small, and then it almost doubles at once. What do you do about it, unless you have some on hand when the demand comes? Some dealers are caught napping—caught without any. Some one must have some put away on ice, or there would be a shortage.

MR. LYTHGOE: If your milk does not change, you can keep it any length of time, and it will be just as good as when fresh. I have pasteurized milk at an exceedingly high temperature for the sake of spore-bearing bacteria, and allowed it to set until it was rotten.

The gentleman spoke of the cream line as determining the value of milk, but in pasteurized milk it does not always appear, because, under certain conditions, the cream does not always rise, and it is not safe to judge by that. I personally believe that milk should be sold on its merits, and people who desire it should get it by paying more for it; people who cannot afford it can buy cheaper milk. The public is not paying fair prices for its milk. I figured out the value of milk, based upon the fuel value as regards the milk content, and found that milk was worth six and one-quarter cents per quart, and skim-milk was worth about four cents per quart. You cannot sell milk in the city unless the food content is about a certain fixed minimum. But there has been no demand to sell milk, according to the food percentage, as it should be. In Maine, the Turner Center people are apparently buying milk according to the food content, but the consumers in Boston are buying, not according to value, but according to the cleanliness. Whether it is profitable to buy as the Maine people do, I cannot say. I have seen milk coming from dirty and from clean dairies and dumped into the same bin and pasteurized. One man was bringing milk from Jersey cows, and getting no more than the man who owned Holstein cows, though it costs more to produce Jersey milk.

DR. WOODS: Does the preservation of milk depend upon the milk pasteurized? Commercial pasteurization is practically without influence upon the chemical condition of the milk, except in the destruction of the so-called enzymes. If milk is pasteurized at very high temperatures the albumen begins to coagulate. The change occurs at about 185 degrees Fahrenheit. When you get the temperature above 150 the albumen begins to coagulate, and then the milk will have a cooked taste.

QUESTION: If pasteurized milk has been kept a long time, would the results of using be more disastrous than from raw milk which had been kept a long time? Will there be a danger from the acid condition of the raw milk?

ANSWER: The pasteurized milk will have the advantage in that the disease germs have been destroyed.

QUESTION: Regarding the use of clarifiers, offered by the separator companies, can we run our milk through the clarifiers and avoid the need of its being pasteurized?

DR. NORTH: Specifically, I would not advise putting the milk through the clarifiers. In New York most of the clarification is done at the shipping stations. I would not advocate it for every farmer; clarification by the dealers is as far as I would go. There is rather a marked prejudice in the minds of the producers against some of the things that are being advocated in the city. Farmers as a class are inclined in testing the milk for bacteria, to think this is sufficient. This new scheme for grading has been proposed for legislation in New York State, and has been proposed in New York City. I assume, as our point of departure, that we must take it for granted that the farmers look upon the production of milk as a business, and in guaranteeing this milk they want to create a market for it. The people of the city prefer to buy guaranteed milk. I heard an old farmer say, "These deaths of the children in the city do not interest me; if I cannot make enough money to take care of my own children, they suffer. We are looking after our own children."

We are looking upon this milk question from the point of the producer and not from the point of the consumer. It seems to me that you must look at this from a business standpoint, and if you study it closely, you will see that it is for your financial advantage, leaving out the question of decency, from the point of sanitation. I maintain that if you look at it from a business standpoint, that pasteurization creates a market for your milk, and as long as the market for milk is in the city, you can create this market in no other way. The milk business is something like a powder magazine—you can never tell when your milk trade will be blown up and put you out of business, by some epidemic, unless you have it pasteurized, because diseases will crop out, and the milk may be found to be the cause of the disease. Now, the farmer ought to want the dealer to pasteurize his milk. For the future of the milk market, he ought to want the people of Portland, Boston, New York and other cities to use two quarts where they used only one before, and for that reason they should encourage the pasteurization of milk.

Farmers for years have said it was unjust for a farmer to have a herd of Jersey cows and bring milk to the creamery with five per cent of butter fat, and get no more for his product than the farmer whose milk has only three per cent. At last the farmers are getting justice, because stations are paying premiums for butter fat. It is true that there is just as much difference in the sanitary condition of the milk as there is in the butter fat. One man brings clean milk and another brings dirty milk. The man who takes pains gets no more for his milk than the one who brings dirty milk. Is it not a business proposition to make cleanliness an object? The producer is making a great mistake when he opposes testing for bacteria. By testing milk we find out whether the milk is clean or not, and then we can use a sliding scale by which the farmer is paid, not only according to the butter fat basis, but also on the bacteria count. It seems to me that the farmer who opposes it is taking action against his own interests. The farmer who attaches a label, saying that his milk has been tested and is clean, ought to get more for his milk; otherwise there is no way in which people can tell whether they are getting clean milk or not. We should have clean milk labeled, so that it can be distinguished; and when people see a big letter "A" on the milk cap, it means milk worth ten cents, and you have established a market for extra good milk. We should overcome the opposition to bacteria testing and grading.

QUESTION: I am selling milk in a certain city in this state, where the bacteriologist, in an address a short time ago, made this statement: That the farmers of the country were selling milk to the cities of Grade C quality at Grade A price. I am getting four cents per quart for my milk. I would like to know what the farmers have to say about that?

ANSWER: In one city we have men who have been getting four cents per quart, who were producing one million or more bacteria. Men are getting eight or nine cents with lower bacteria. The simple reason is this: We have not been in a position to properly grade milk.

QUESTION: Is it practicable for the small cities to work out a grade of their own, and have they done it?

ANSWER: New York City has a very rough grading system, because the milk comes in in such enormous quantities that you cannot draw the line very closely, but in your small cities you can have a system that is much more refined. I think two grades would be enough—Grade A for the best and cleanest, and Grade B for the poorer grade. The Board of Health should test this milk; the dealer takes out a license to sell the kind of milk which he wishes. This gives the Board of Health a local control over the milk; because the man who takes out a Grade One license puts himself under obligation to keep his milk up to the standard. If the inspector takes a sample and finds the milk not up to grade, he inspects it again very soon; if it is not up to grade, it falls into the lower grade, and the dealer is fined. It costs less to ask the laboratory to test the milk, and take out the poor milk.

MR. BRADFORD: If milk is brought in, testing under a hundred million bacteria count, and was properly pasteurized, and when it is pasteurized the count was found to be two thousand or less, which I believe is a fair count; if that is cooled to 40 degrees or below (we say on our city carts, milk must be kept below 50 degrees) and it is kept a week and tested again and it seems all right, I would like to know explicitly if that milk is safe?

MR. LYTHGOE: So far as I can see, that milk is just as good as it was when first pasteurized.

MR. BRADFORD: I remember a case where milk was carried from Chicago to the Paris Exposition, tested and took the first prize. Wisconsin was the dairy school where it started from. It was not pasteurized, but it took the first prize. Was it safe milk to use? Is it all right to keep milk a week under proper conditions and then sell it? Is it dangerous? Sometimes it is necessary to keep it, but is it right to sell it?

DR. NORTH: We discussed at great length this question of age, as to whether a date means anything, and the opinion of milk experts at our convention seems to be that the date is meaningless, if you put a date on a bottle or can, because the whole question is, what was that milk in the first place? Milk a week old, kept under proper conditions, may be better than milk an hour old.

MR. BRADFORD: Several years ago I put forth the idea at one of these meetings that the notion of putting the milk in cold water, with the idea of getting the animal heat out of it, was nonsense; I could not see any difference between animal heat and any other heat, and I could not see how the heat was coming out of the little neck of a can. That was a curious idea; I guess it is pretty well understood now, that the proper thing to do is to close the can and set it into cold water. We try to sterilize our cans pretty well, and I asked our man this morning what counts he had found. He takes a can and some sterilized water and washes it out and tests it for bacteria, and he tries to know as nearly as possible how many bacteria are in that can. He told me it counted but one bacteria in a cubic centimeter. That is a pretty small percentage, or even when there are several of them. My idea is to put a cover on the can, and tell the farmer to leave the cover on until he gets ready to use it. I am going to advise them to leave it on until ready to fill; then take the cover off, fill and put the cover on as soon as possible. This is something we have not done yet.

QUESTION: What about that can and the odor, if kept in a warm place?

ANSWER: We use a small rubber ring, and I think that is what causes the odor, mainly, that we get; and that odor, when we pour the milk into the can, will come out; if there is any bacteria in the odor, it won't hurt anything. I have tried by experimenting to see if I could taste that rubber odor in the milk, but never found that it did any harm.

QUESTION: The New York contractors sterilize the cans by steam, and then dry them by a blast of dry hot air and put the cover on. The farmer is told to keep the cover on until the milk is poured in.

MR. BRADFORD: What is the science of that, anyway? Why use hot air?

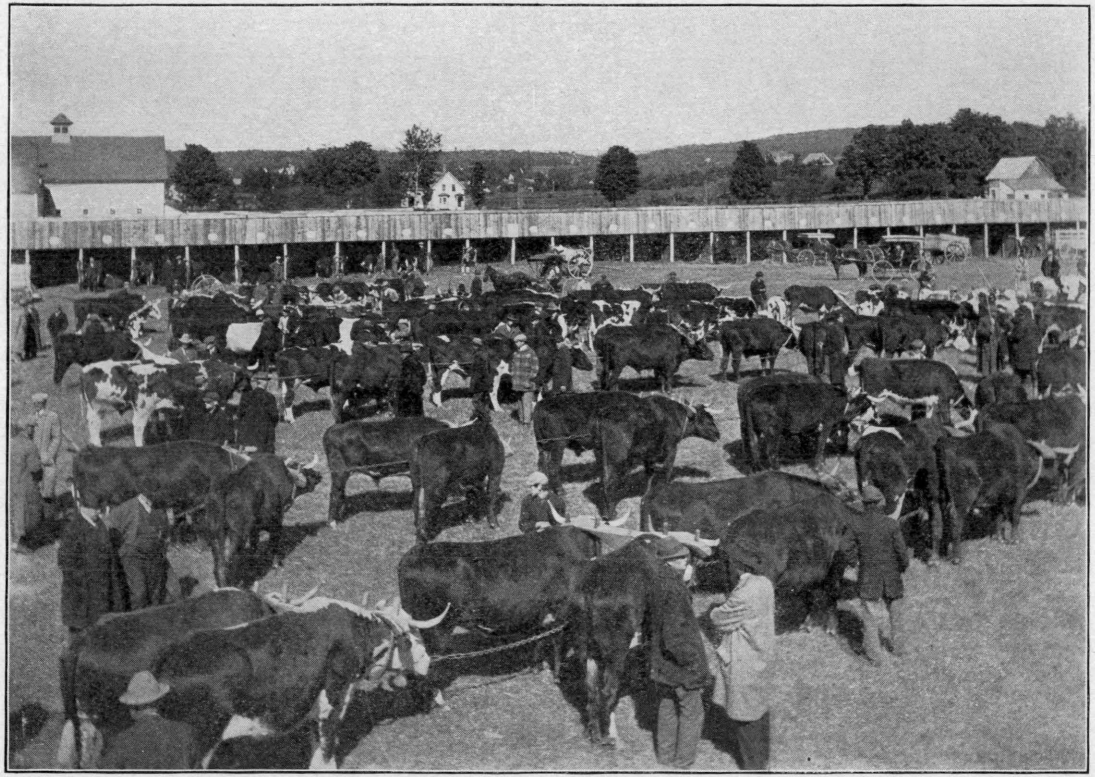
ANSWER: Hot air dries the can, and bacteria cannot grow in a dry place.

DR. WOODS: If we take air and cool it down to above zero degree, the air has practically no water in it, and so we use refrigerating machine with practically no water in it. Water is in the air, and air at certain temperature will contain a large amount of water; as it cools down there will be less and and less water in it. If we could have dry air in Maine there would be probably 90 per cent of the time that cold air would be as dry as the warm air in Boston. A morning like this the air is pretty nearly saturated and the can will not warm the air enough to absorb the water, so the moisture in the can will be condensed.

MR. BRADFORD: You may take ten cubic feet of air, out here where it is moist, and put it into a space and heat it and there is just as much water in it after it goes through the heat as before. That air fills more space than before; there are more spaces or interstices in it; of course it has expanded and yet the water is there. Although the heat in the can won't help it any, I think the warm air would dry out the can more rapidly.

DR. GARCELON, of Lewiston Board of Health: We are interested in the tuberculin test of milk. Is it possible to so sterilize milk as to render it safe against the germs of tuberculosis?

ANSWER: American investigators have made many investigations; their records show that 150 degrees in 20 minutes were enough to destroy the germs of tuberculosis. Dr. Rosenthal repeated the work of German investigators, also that of the American investigators, to find what is called the thermal death point of disease bacteria in milk. The leaders of sanitary science in this country have suggested that we use 145 degrees for 30 minutes, instead of 150 for 20 minutes, because 150 degrees damages milk somewhat, and 145 seems between the temperature which is not safe and that which damages the milk. I feel that it may be considered safe from tuberculosis.



Farmington Fair—where the ox has not yet passed.

CATTLE BREEDING PROBLEMS AND THEIR SOLUTION.[1]

RAYMOND PEARL.

For some time past the writer has been occupied in the study of various problems, both practical and theoretical, connected with cattle breeding. At different times reports of the progress of these investigations have been made to the Maine Dairymen's Association and the Maine Live Stock Breeders' Association. It is the purpose of the present paper to continue this practice. We shall consider a number of problems on which attention has been concentrated during the past year, in which the practical cattle breeder has a direct and practical interest. The results so far obtained do not give the solution of any of the problems. On the other hand, these results do help us forward in our analysis of them. There is no short cut to that kind of knowledge which will make possible such control of the processes of heredity as will enable the breeder surely to attain the results he desires. Such knowledge can only be had as a result of the careful, painstaking, and necessarily slow collection and analysis of accurate data. It is just this thing which the Maine Agricultural Experiment Station is trying to do in its investigations along cattle breeding lines.

In the present paper the following topics were discussed and the work which had been done on each at the Maine Agricultural Experiment Station was outlined:

1. The relation of milk flow to age in dairy cattle.

2. Comparison of American Advanced Registry Ayrshires with Ayrshires in Scotland in respect of milk production.

3. The construction and use of a Dairy Efficiency Table.

4. Inbreeding in dairy cattle, with special reference to the Jerseys.

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[1](From the Biological Laboratory of the Maine Agricultural Experiment Station.)

5. The physiology of cattle breeding, including: (a) The normal duration of heat (oestrum) in cattle; (b) The length of time a breeding cow is dry; (c) The age of breeding stock; (d) Cystic degeneration of the ovaries.

6. The inheritance of milk and butter fat producing ability.

During the past year, work on the investigation outlined in earlier reports has been prosecuted energetically. It is possible to report definite progress along several lines at this time. In presenting this report each of the general lines of investigation going forward will be separately considered.

I. The Study and Analysis of Milk Records.

During the past year the work in this direction has fallen into three chief divisions, viz: (a) The preparation for the press of the results of the extended study of the relation of milk flow to age in dairy cattle; (b) The preparation of a Dairy Efficiency Table; (c) The transfer and analysis of the Biltmore herd records.

(a) Relation of Milk Flow to Age in Dairy Cattle.

The main essential results of this investigation were in hand at the time of the last annual report. It has been possible to demonstrate in the most complete manner from extensive data on the three breeds, Jerseys, Holstein-Friesian, and Ayrshire, that the change in milk-flow as a cow grows older follows a definite law, expressible in the form of a mathematical equation. A preliminary statement of this law has been published.[1]

The preparation of this material for printing has been a laborious and time-consuming task. It is now hoped that, within a few months following this report, the complete manuscript will be ready for the printer. In connection with the preparation of this material for the press, a number of interesting subsidiary matters have come to light. One may be briefly considered here.

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[1]Pearl, R. On the Law Relating Milk Flow to Age in Dairy Cattle. Proc. Soc. Exper. Biol. and Med., Vol. XII, pp. 18-19, 1914.

COMPARISON OF AMERICAN ADVANCED REGISTRY AYRSHIRES WITH AYRSHIRES IN SCOTLAND IN RESPECT TO MILK PRODUCTION.

As set forth in our last report, the records furnished by the Scottish Milk Records Society have been the basis of our study of Ayrshire milk production. These records, it will be recalled, correspond to American cow-test association records in this particular, that the records of *all* cows in each herd, good, bad, and indifferent, are included. During this past year we have been able, through the kindness of Dr. J. A. Ness, President of the Ayrshire Breeders' Association, and C. M. Winslow, Secretary, to compare the American Advanced Registry Ayrshire records with these Scottish records. The results of such comparison, in part, are shown in Table 1.

TABLE 1.

Comparing Mean Weekly Yields (in Gallons) of (a) American Advanced Registry, and (b) Scottish Milk Record Society Ayrshire Cows.

AGE OF COW.	American advanced registry.	Scottish milk records society.	Difference.
Two years	14.84 ± .08	13.61 ± .18	1.23
Three years	16.76 ± .14	13.84 ± .04	2.92
Four years	17.47 ± .14	15.23 ± .06	2.24
"Mature"	20.32 ± .13	18.56 ± .09[3]	1.76

[3]This figure is for 9-year-old cows.

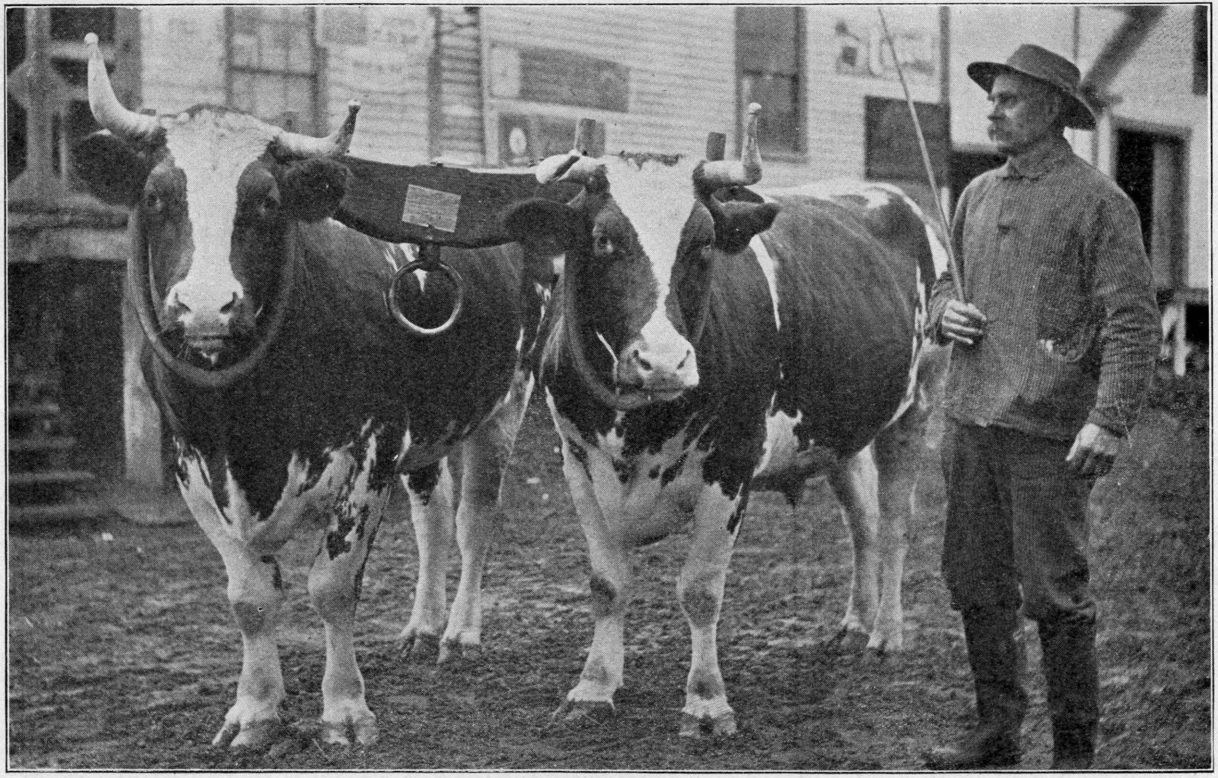
From this table it will be seen that the American Advanced Registry Ayrshires outyield their Scottish sisters, on the average, from about one and a quarter gallons to three gallons per week, or roughly, from ten to 25 pounds. Looked at from a relative standpoint it appears that the American Advanced Registry animals give, as two-year-old heifers or as mature cows, about nine per cent on the average more milk than the Scottish herds. For the three year and four year ages the percentage is higher.

The standards for admission to advanced registry are just as high for the Ayrshire as for any other breed. It appears a fair question as to whether a standard which runs less than ten per cent above the general average of the breed for mature cows is sufficiently high to get the best results in the direction of breed improvement.

(b) A DAIRY EFFICIENCY TABLE.

The following kind of question constantly arises in cow-test association work: Herd X is made up of cows of various ages, from 2 to 14 years, the majority of the cows being fully matured (six years or over). These cows last freshened at various times. The average production of the herd per cow in the last year was 7,500 pounds of milk. Herd Y is also made up of cows of various ages, but most of them are young, i. e., *under* full maturity. They freshened at various times and gave for the year an average flow of 6,000 pounds per cow. Is Herd X a better producing herd than Herd Y, taking age of cows, average stage of lactation, etc., into account?

Hitherto there has been no definite scientific method of dealing with this problem. The need for something of the sort was first urged to the writer by H. M. Look, the tester for the Winthrop Cow Test Association. It was suggested that the problem might be looked at in the following way. On the average a cow may be regarded as working at her maximum efficiency when she is, on the one hand, fully mature in age, but not too old, and on the other hand, at the beginning of a lactation period, say during the first month. Suppose this maximum efficiency be designated as 100 per cent. Then the cow's efficiency in performance at any other age or stage of lactation will be represented by some percentage below 100. Given the proper data, and by the use of appropriate mathematical methods, it is possible to construct a table which will give these efficiency percentages at various ages and months of lactation. Such a table has been prepared in this laboratory and is herewith presented as Table 2. The method of calculating this table cannot be gone into here for lack of space, but will be presented in a later publication.



A good team and a good teamster.

TABLE 2.

Table of Efficiency Percentages for Milk Production in Dairy Cattle.

AGE OF COW IN YEARS AND MONTHS.	MONTHS SINCE FRESHENING (Stage of Lactation).																							
	1 %	2 %	3 %	4 %	5 %	6 %	7 %	8 %	9 %	10[4] %	11 %	12 %	13 %	14 %	15 %	16 %	17 %	18 %	19 %	20 %	21 %	22 %	23 %	24 %
1.6–1.11................	58	54	51	47	44	41	37	34	30	27	27	27	26	26	26	26	26	26	25	25	25	25	25	25
2.0–2.5................	73	69	64	60	56	52	48	43	39	35	35	35	34	34	34	34	34	34	33	33	33	33	33	33
2.6–2.11................	82	77	72	67	62	57	52	47	41	36	36	36	36	36	35	35	35	35	35	34	34	34	34	34
3.0–3.5................	89	83	77	71	66	60	54	48	43	37	37	37	37	37	36	36	36	36	36	35	35	35	35	35
3.6–3.11................	93	87	81	75	69	62	56	50	44	38	38	38	38	38	37	37	37	37	37	36	36	36	36	36
4.0–4.11................	97	91	84	78	71	65	58	52	45	39	39	39	39	38	38	38	38	38	37	37	37	37	37	36
5.0–5.11................	100	93	86	79	72	66	59	53	46	39	38	38	38	38	38	37	37	37	37	37	37	36	36	36
6.0–6.11................	100	93	86	79	72	65	58	52	45	38	38	38	38	37	37	37	37	37	36	36	36	36	36	35
7.0–7.11................	99	92	85	78	71	64	57	51	44	37	37	37	37	37	37	36	36	36	36	36	36	35	35	35
8.0–8.11................	97	90	84	77	70	63	56	50	43	37	37	37	37	37	36	36	36	36	36	35	35	35	35	35
9.0–9.11................	94	88	82	75	69	62	55	49	43	36	36	36	36	36	36	35	35	35	35	35	34	34	34	34
10.0–10.11................	91	85	79	73	67	61	54	48	42	36	36	36	36	35	35	35	35	35	35	34	34	34	34	34
11.0–11.11................	88	82	76	71	65	59	53	47	41	35	35	35	35	35	35	34	34	34	34	34	33	33	33	33
12.0–12.11................	85	80	74	68	63	57	52	46	40	35	35	35	35	34	34	34	34	34	33	33	33	33	33	33
13.0–13.11................	82	76	71	66	61	55	50	45	39	34	34	34	34	34	33	33	33	33	33	32	32	32	32	32

[4]From this point to the end of the table it is to be understood that the figures apply only to cows which do not breed and consequently have greatly prolonged periods of lactation. For cows *ending* the lactation in earlier months the curve should be considered to drop abruptly to zero. For all ordinary purposes it may be assumed with quite sufficient accuracy that the mean percentage efficiency of a cow for the month in which her lactation ends is *one-half* the tabled figure for the same month in the above table.

The manner in which the table is to be used may be shown by an example. Let us compare two herds of Holstein cattle, of approximately the same size and on nearly the same date.

TABLE 3.

Herd A, October 6, 1915.

Name, number, or other distinguishing mark of each cow or heifer. Cow (or heifer) No.	Is the cow milking now or dry?	When did she calve (freshen) last?	What is her age? (approximate).	Month of lactation.	Efficiency percentage (from Table 2.)
1	Milking	January '15	6	9	46
2	Milking	December '14	4	10	38
3	Milking	September '15	11	1	88
4	Milking	March '15	7	7	58
5	Milking	April '15	7	7	58
6	Milking	January '15	9	9	43
7	Milking	January '15	2	9	30
8	Milking	December '14	2	10	27
9	Milking	February '15	2	8	34
10	Milking	December '14	2	10	27
11	Dry	October '14	6	-	0
12	Dry	October '14	5	-	0
13	Dry	April '14	8	-	0
14	-	Heifer	1	-	-
15	-	Heifer	1	-	-
16	-	Heifer	1	-	-
17	-	Heifer	1	-	-
18	-	Heifer	1	-	-
19	Milking	September '15	3	1	89

Total cows and heifers in herd=19. Total cows dry=3.
Total cows milking=11. Total heifers not yet freshened=5.
Total cows which have borne calves=14.
Average Efficiency Percentage for all cows which have borne calves=

$$\frac{46+38+88+58+58+43+30+27+34+27+0+0+0+89}{14}=\frac{538}{14}=38.43\%$$

Average Efficiency Percentage for all cows now milking $=\frac{538}{11}=49.00\%$

Total lbs. milk production October 6, 1915=260.
Average per cow which has borne a calf $=\frac{260}{14}=18.57$ lbs.

Average per cow now milking $=\frac{260}{11}=23.64$.

Calculated total milk if herd were operating at 100 per cent. efficiency (on the basis of all cows capable of milking) $=\frac{26000}{38.43}=676.6$ lbs.

Calculated total milk (on the basis of all cows now milking) $=\frac{26000}{49.00}=530.6$ lbs.

Average per cow=48.2 lbs.

TABLE 4.

Herd B, October 1, 1915.

Name, number, or other distinguishing mark of each cow or heifer. Cow (or Heifer) No.	Is the cow milking now or dry?	When did she calve (freshen) last?	What is her age? (approximate.)	Month of lactation.	Efficiency percentage (from Table 2).
1	-	Heifer	2	-	-
2	-	Heifer	2	-	-
3	Milking	September '15	3	1	89
4	Milking	September '15	2	1	73
5	Milking	November '14	3	11	36
6	Dry	August '14	3	-	0
7	Dry	July '14	3	-	0
8	Milking	Decem er '14	4	10	38
9	Milking	April '14	6	18	37
10	Milking	September '15	2	1	73
11	Milking	Septem er '15	3	1	89
12	Milking	September '15	3	1	89
13	Milking	February '15	6	8	53
14	Milking	April '15	8	6	63
15	Milking	May '15	8	5	70
16	Milking	March '15	12	7	53
17	Milking	April '15	12	6	57
18	Dry	October '14	6	-	0
19	Dry	October '14	3	-	0
20	Milking	September '15	2	1	73

Total cows and heifers in herd=20. Total cows dry=4.
Total cows milking=14. Total heifers not yet freshened=2.
Total cows which have borne calves=18.
Average Efficiency Percentage of all cows which have borne calves=

$$\frac{89+73+36+0+0+38+37+73+89+89+53+63+70+53+57+0+0+73}{18}=$$

$$\frac{893}{18}=49.61\%$$

Average Efficiency Percentage for all cows now milking $=\frac{893}{14}=63.79\%$

Total lbs. milk produced October 6, 1915=290.
Average per cow which has borne a calf $=\frac{290}{18}=16.1$ lbs.

Average per cow now milking $=\frac{290}{14}=20.7$ lbs.

Calculated total milk if herd were operating at 100 per cent efficiency (on the basis of all cows which have borne calves) $=\frac{29000}{49.61}=584.6$ lbs.

Calculated total milk (on the basis of all cows now milking) $=\frac{29000}{63.79}=454.6$ lbs.

Average per cow=32.5 lbs.

From the above figures it is possible to make precise and definite comparisons between these two herds. We note, in the first place, that Herd B was operating with more than 10 per cent greater efficiency at the time the records were made than was Herd A. Bringing both herds to the same basis of efficiency (100 per cent)[5], however, it is plain that ***the cows in Herd A are much better cows than those in Herd B***, the average production per cow on the same efficiency of operation basis being about 16 pounds per day higher in the former than in the latter. This is the fact. Herd A is one of the best herds of pure-bred Holstein-Friesian cattle in the state, nearly every cow having an A. R. O. record. Herd B is only a fair average herd.

Table 2 has many uses besides that of herd comparison here illustrated. It may be used for the comparison of individual cows. It forms a much more scientifically accurate basis for the age correction of advanced registry records than do the rules of entry to advanced registry of any association in this country.

(c) ANALYSIS OF BILTMORE RECORDS.

This matter will be considered in a later section of this paper (Cf. p. 240).

II. THE STUDY OF INBREEDING IN DAIRY CATTLE.

During the past year the work on the theoretical side of this problem has been extended along two lines. The first[6] deals with the results which may theoretically be expected to follow the continued mating of first cousins of different types, and also continued mating of the type uncle x niece. The second[7]

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[5]Of course any other percentage could have been taken instead of 100. The essential thing is to compare *both* herds on the *same* percentage basis of operation efficiency. One hundred per cent is as good, and in some regards perhaps better than any other basis on which to make the comparison.

[6]Pearl, R. Studies on Inbreeding. VI. Some further considerations regarding cousin and related kinds of mating. Amer. Nat., Vol. XLIX, pp. 570-575, 1915.

[7]Pearl, R. A System of Recording Types of Mating in Experimental Breeding Operations. Science, N. S., Vol. XLII, pp. 383-386, 1915.

has to do with a system of recording types of pedigrees in experimental or other breeding operations. This will chiefly be of use to those who are keeping precise records and breeding more or less along experimental lines. There has also been prepared a bulletin on the general subject, which is now in press[8].

With the very efficient aid of S. W. Patterson the study of inbreeding in Jersey cattle has been brought to completion and the results are now being prepared for the press. They give us for the first time a definite, comprehensive, and quantitative idea of the average degree of inbreeding prevailing in a race or breed of domesticated animals, at a particular time in the history of that breed. Because of the novelty and general interest of these results certain of them are here reproduced in Table 5 and Figs. 1-4 inclusive. The derivation and significance of coefficients of inbreeding have been explained in earlier publications[9] and need not be repeated here. For reasons which cannot be gone into here, but will be in the detailed publications, it is impossible in the case of cattle to arrive at an absolutely exact value of the mean inbreeding coefficients. What we can do is to determine upper and lower limiting values, between which the true, and undeterminable value lies. Such upper and lower limiting values are presented in Table 5. Recalling that the *higher* the value of a coefficient of inbreeding the *more intensely* the animal is inbred, we may turn our attention to Table 5 and the diagrams.

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[8]Pearl, R. Further Data on the Measurement of Inbreeding. Me. Agr. Expt. Stat. Bull. 243, 1915.

[9]Cf. for example, Pearl, R. The Measurement of the Intensity of Inbreeding. Me. Agr. Expt. Stat. Bull. 215, 1913.

TABLE 5.

Showing Mean or Average Coefficients of Inbreeding for American Jersey Cattle, for both Random Samples of the General Population of both Sexes and Samples of the Animals in the Register of Merit.

Class or Group.	No. of pedigrees included in sample.	Mean Coefficients of Inbreeding. Z_0 Parents. Lower limit.	Upper limit.	Z_1 Grandparents. Lower limit.	Upper limit.	Z_2 Great-grandparents. Lower limit.	Upper limit.
1. General population (random sample) bulls	67	0	0	1.87	1.87	5.41	5.41
2. Register of Merit bulls	63	0	0	1.59	1.59	5.36	5.62
3. General population (random sample) cows	61	0	0	4.10	4.10	6.97	6.97
4. Register of Merit cows	63	0	0	0	0	2.98	2.98

Class or Group.	Mean Coefficients of Inbreeding. Z_3 Great-great grandparents. Lower limit.	Upper limit.	Z_4 Great-great--great grandparents. Lower limit.	Upper limit.	Z_5 (Great)^4 grandparents. Lower limit.	Upper limit.
1. General population (random sample) bulls	11.01	11.21	19.59	20.79	29.48	32.77
2. Register of Merit bulls	14.88	15.91	23.32	28.39	30.28	43.99
3. General population (random sample) cows	12.50	12.59	21.26	21.89	31.53	33.82
4. Register of Merit cows	9.23	9.42	15.33	16.27	24.63	28.53

Class or Group.	Mean Coefficients of Inbreeding. Z_6 (Great)^5 grandparents. Lower limit.	Upper limit.	Z_7 (Great)^6 grandparents. Lower limit.	Upper limit.
1. General population (random sample) bulls	39.14	47.93	46.07	63.12
2. Register of Merit bulls	34.80	62.03	37.07	77.77
3. General population (random sample) cows	41.03	48.18	47.56	63.10
4. Register of Merit cows	33.12	44.06	39.22	61.45

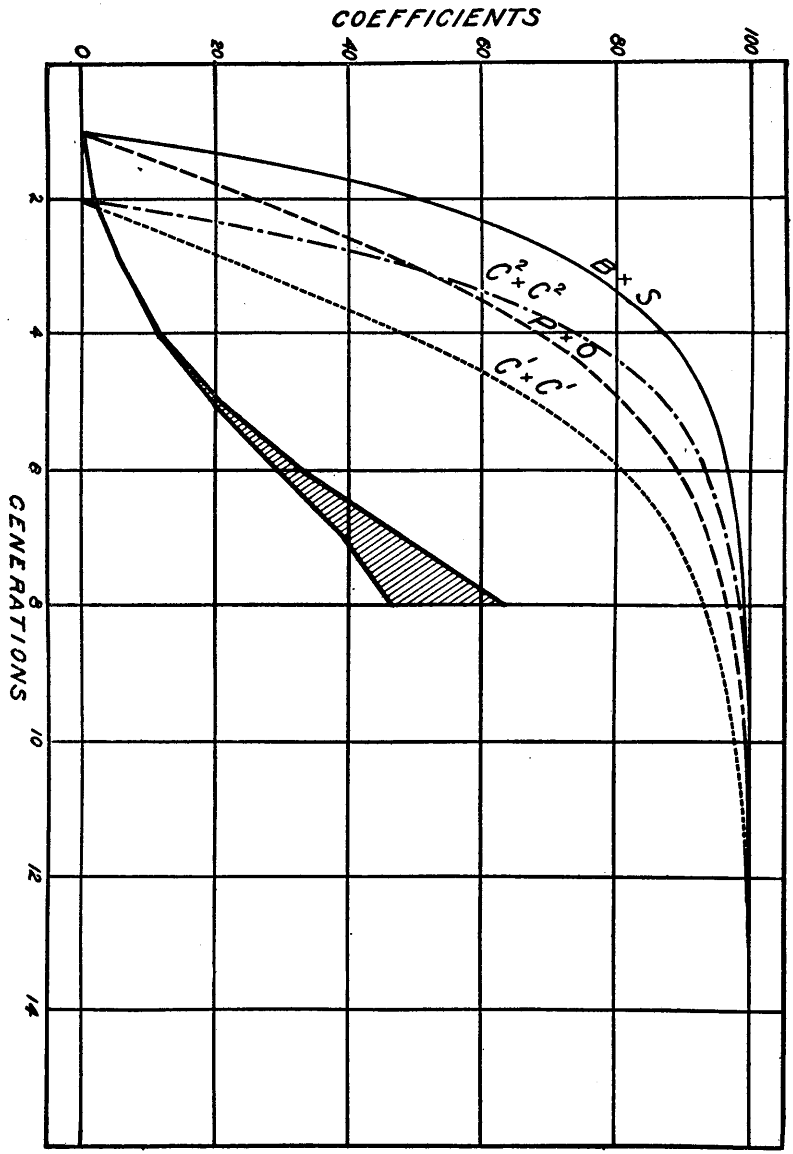


Fig. 1. Diagram showing the inbreeding curves for a random sample of the general population of American Jersey bulls. The two heavy lines give the upper and lower limiting values for the successive mean inbreeding coefficients. The true value of the curve lies somewhere in the ruled area between these heavy lines. For comparison the curves for continued brother x sister (B x S), parent x offspring (P x O), and first cousin x first cousin breeding are included. C^1 x C^1 denotes single cousin matings, and C^2 x C^2 double cousin matings.

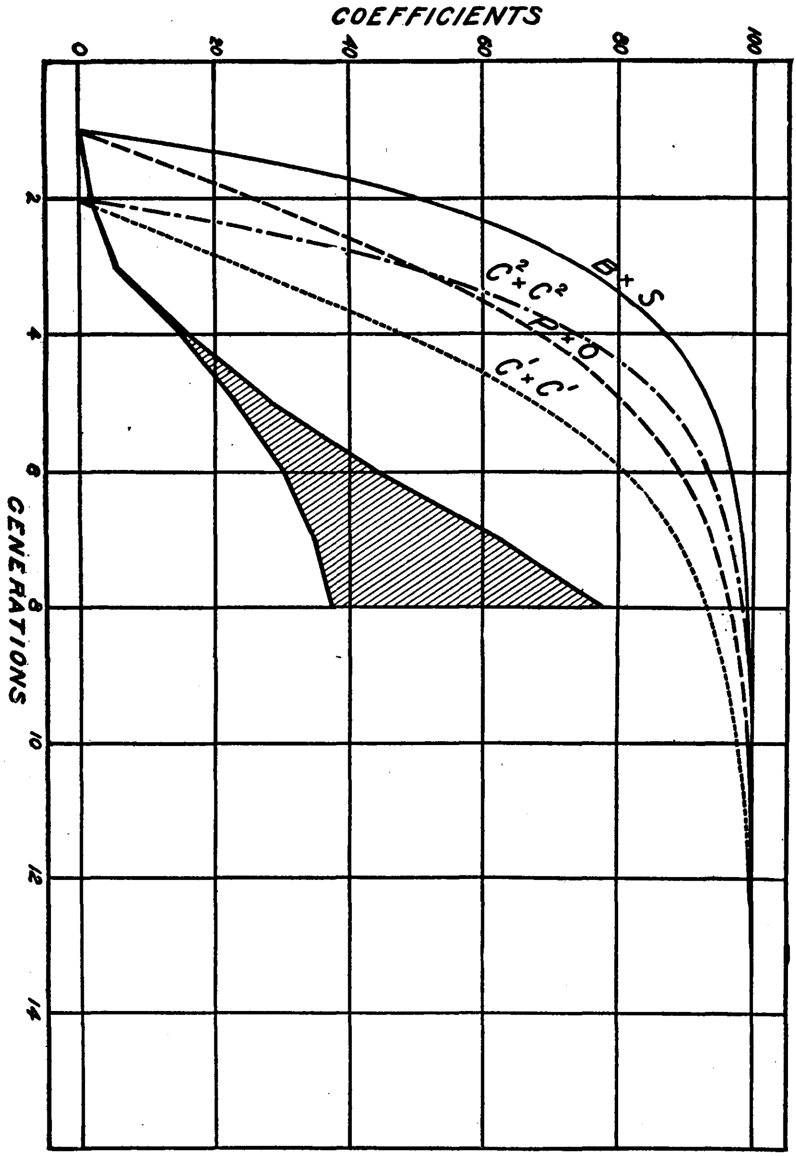


Fig. 2. Diagram showing the inbreeding curves for a sample of Register of Merit Jersey bulls. The lines have the same significance as in Fig. 1, *q. v.*

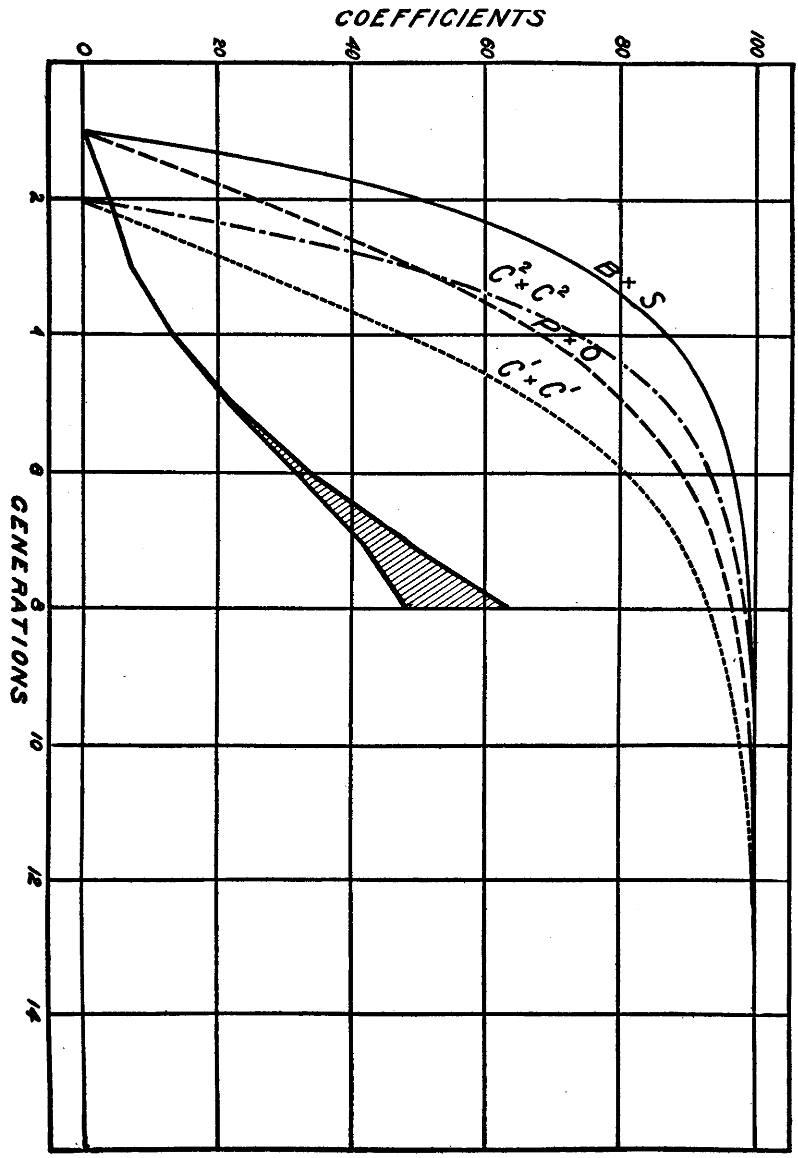


Fig. 3. Diagram showing the inbreeding curves for a random sample of the general population of American Jersey cows. The lines have the same significance as in Fig. 1, *q. v.*

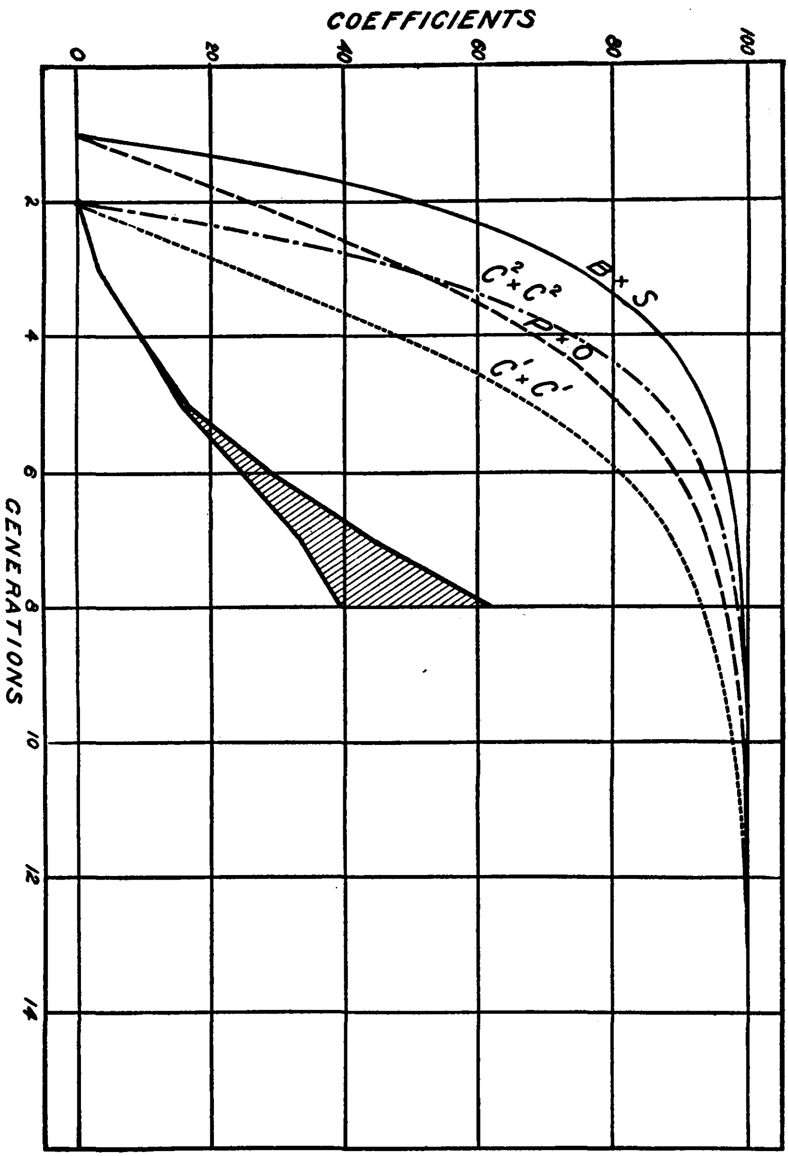


Fig. 4. Diagram showing the inbreeding curves for a sample of Register of Merit Jersey Cows. The lines have the same significance as in Fig. 1, *q. v.*

For an analysis of Jersey inbreeding records two results, among others, stand out with particular clearness and significance. These are:

1. That American Jersey cattle at the present time, may be said in general and on the average to be about one-half as intensely inbred, when account is taken of the eighth ancestral generation, as would be the case if continued brother x sister breeding had been followed. The *form* of the inbreeding curve is, however, very different in the two cases, the brother x sister curve being concave to the base line throughout, while the actual Jersey curves tend to have their principal curvature convex to the base.

2. That, in general and on the average, Register of Merit animals are *less* intensely inbred than the general population of Jersey cattle.

A detailed report of the work on inbreeding in Jerseys will be published shortly. The above notes are intended to be merely of a preliminary character.

III. Cooperative Cattle Breeding Records.

During the past year this project has gone forward smoothly and satisfactorily. We are accumulating a unique and extremely valuable collection of data regarding many problems in the physiology of cattle breeding. Some of the original cooperators have, of course, dropped the work during the year, for various good reasons. A substantial group of progressive breeders has remained faithful to the project and sent in carefully made records with unfailing regularity.

At this time we wish to take occasion again to thank most heartily the breeders who have so kindly cooperated in this work. We realize that it is some trouble to the breeder to fill out these blanks and that when he does it, it is without any thought of immediate personal gain, but from the altruistic motive of helping along the general knowledge of the laws of breeding in dairy cattle. We are extremely grateful to those who are helping us.

We are always glad to add new cooperators to this list. Anyone interested in taking up the work, whether a resident of Maine or some other part of the country, should communicate with the writer of this report. It is expected that the collection of breeding records will be continued for at least one more year.

It appears desirable at this time to present brief statements regarding certain of the results which have been reached from the study of these records. This is done in Section IV of this report. Detailed publication will follow in due time in another place.

IV. Physiology of Cattle Breeding.

Here we shall consider certain topics based in part upon the cooperative breeding records, and in part upon other studies.

1. THE NORMAL DURATION OF HEAT (OESTRUM) IN CATTLE.

The cooperative breeding records furnish extensive data bearing upon this point. Table 6 shows for various breeds the number of hours which elapsed between (a) the time when the breeder observed that the cow was in heat and (b) the time when she was served by the bull. *All* of the services recorded in this table were successful, i. e., the cow became pregnant as a result of the recorded service, and either carried the calf to term, or aborted at some time before term.

TABLE 6.

Showing for Various Breeds of Cattle the Time in Hours between the Observance of Heat and the Successful Service of the Cow.

BREED.	LAPSED TIME IN HOURS.																																									
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	Totals.
Jersey grade	5	17	10	23	18	11	9	9	3	6	6	7	2	6	1	3	2	1	-	2	-	1	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	145
Guernsey grade	6	5	7	11	7	8	6	8	7	3	-	3	4	5	4	5	2	-	-	1	2	4	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	100
Ayrshire grade	-	4	7	8	3	3	3	2	1	4	2	-	1	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41
Holstein grade	20	22	22	32	13	19	11	16	11	6	9	12	10	6	5	5	1	-	-	-	1	-	-	-	-	-	-	1	2	-	-	-	-	1	-	-	-	-	-	-	-	-	225
Shorthorn grade	2	-	-	1	1	1	1	2	3	1	1	1	1	2	1	1	-	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22
Pure-bred Jersey	13	10	9	11	8	8	5	4	-	6	2	4	3	2	2	-	2	-	-	-	-	1	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93
Pure-bred Guernsey	4	5	2	4	2	-	3	-	1	3	-	1	1	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28
Pure-bred Ayrshire	4	7	9	6	7	3	1	2	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42
Pure-bred Holstein	13	3	5	9	5	6	4	14	4	3	3	5	1	1	2	3	-	1	-	1	-	3	-	1	2	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	91
Other known breeds	3	3	1	4	1	-	3	2	1	2	-	3	-	2	-	-	1	-	-	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29
Breed not known	2	3	1	4	-	2	1	1	1	1	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Totals	72	79	73	113	65	61	47	60	32	35	24	36	24	26	17	18	8	4	-	6	3	9	4	1	8	1	-	1	4	-	1	-	-	1	-	-	-	-	-	-	-	1	834

From this table the following constants are deduced:

Average number of hours from discovery of heat to service	$= 6.357 \pm .134$ hrs.
Standard deviation	$= 5.737 \pm .095$ hrs.
Coefficient of variation	$= 90.25$ per cent.

From the above data it appears that:

1. Successful fecundation of the cow may occur as many as 41+X hours after the onset of heat. What the value of X in this expression is is not entirely clear but the available evidence indicates that it is small.

2. While in an isolated instance successful service after so long a time as 41 hours may occur, we see from Table 6 that, in general, the vast majority of successful services occur at much shorter time intervals than this after the discovery of heat. Thus over 79 per cent. of these 834 successful services occurred within ten hours after the discovery of heat. The inference from this table is plainly that if one wishes to be sure of getting a cow with calf it is not wise to postpone service much beyond ten hours after the cow is known to be in heat.

3. There appear to be no significant differences between the distributions for the different breeds.

Further work on this subject, in which successful and unsuccessful services will be compared, is now in progress.

2. THE LENGTH OF TIME A BREEDING COW IS DRY.

One of the points on which the cooperative record blanks furnish data is as to the time each cow is dry prior to calving. Two important factors are involved here: One, the normal duration of lactation, which varies from individual to individual and is probably a matter of inheritance in large part; the other, the method of managing and feeding the animals. Some progressive dairymen aim to keep a cow continuously milking, never letting her go dry, but keeping her in good physical condition by appropriate feeding. It is of interest to examine statistically the facts regarding this matter from the herds of something like 150 of the most progressive dairymen in Maine. The data for 712 cows are given in Table 7.

TABLE 7.

Showing the Time (in days) During which Cows were Dry before Calving.

DAYS DRY.	Frequency.	Percentage frequency.
0-39	205	28.79
40-79	408	57.30
80-119	65	9.14
120-159	28	3.93
160-199	4	.56
200-239	2	.28
Totals	712	100.00

From this table we have the following constants:

Average number of days dry = $56.404 \pm .744$
Standard deviation in number of days dry = $29.410 \pm .526$
Coefficient of variation = 52.14 per cent.

It thus appears that on the average these cows were dry about 4 days short of two months. Only about 14 per cent of them were dry more than 79 days. On the other hand about 29 per cent were dry less than 40 days. Cows dry four, five, and six months can scarcely be profitable. There must be a very strong reason for desiring a calf from a particular cow to warrant carrying her dry in the herd for a long period of time.

3. THE AGE OF BREEDING STOCK.

The age of the animal is an important factor in many problems of cattle breeding. For example, as has been pointed out already (p. 216), the milk production of a cow changes with age in a definite way. This means that the profitable limits of age of a cow as a milker can be determined with precision. What is the composition of the average herd with reference to the age of the cows composing it? Is it in major part made up of cows at their most productive ages?

Again the question of age is of direct importance in any comprehensive scheme of herd improvement by breeding. No principle of genetic science appears to be more solidly grounded than that progeny performance is the only sure test of breeding worth. But if a herd bull is disposed of before any of his progeny have reached an age where their performance as milkers, for example, can be measured, then clearly this guiding principle of progeny test is playing no part in the breeding of the herd. Without this principle in active operation the breeder is in much the circumstances of a mariner without a compass. Progress towards a desired goal is *possible,* but it is likely to be by a very roundabout and haphazard route, and is sure to be very slow.

It is a matter of considerable interest to examine statistically the age of breeding cattle in the hands of progressive Maine farmers and breeders. Data on this point are presented in Table 8. It should be noted particularly that all ages recorded in this table are the ages of the animals *at the time when they were bred successfully.* Each entry in the table is based upon what we call a "completed record." Such a completed record comprises, on the one hand, a service record, and on the other hand a birth record, which sets forth the facts regarding the calf born as a result of the service accounted for on the service record. The ages tabled here are the ages at the time of service.

TABLE 8.

Showing the Age in Years of Cattle Used as Breeders.

AGE IN YEARS.	*a.* Bulls used as breeders.		*b.* Cows which have dropped one or more calves.		*c.* Heifers bred for their first calves.		*d.* All females (*b* + *c*).	
	Absolute frequency	Percentage	Absolute frequency	Percentage	Absolute frequency	Percentage	Absolute frequency	Percentage
1	213	22.03	4	.56	69	41.57	73	8.31
2	252	26.06	83	11.66	92	55.42	173	19.93
3	209	21.61	138	19.38	5	3.01	143	16.29
4	149	15.41	101	14.19	-	-	101	11.50
5	52	5.78	80	11.24	-	-	80	9.11
6	53	5.48	69	9.69	-	-	69	7.86
7	24	2.48	66	9.27	-	-	66	7.52
8	8	.83	44	6.18	-	-	44	5.01
9	3	.31	44	6.18	-	-	44	5.01
10	-	-	33	4.63	-	-	33	3.76
11	-	-	22	3.09	-	-	22	2.51
12	4	.41	13	1.83	-	-	13	1.48
13	-	-	9	1.26	-	-	9	1.03
14	-	-	-	-	-	-	-	-
15	-	-	2	.28	-	-	2	.23
16	-	-	2	.28	-	-	2	.23
17	-	-	1	.14	-	-	1	.11
18	-	-	1	.14	-	-	1	.11
Totals	967[10]	100.00	712	100.00	166	100.00	878[10]	100.00

[10]The reason for the discrepancy between these two figures lies in the fact that on 89 out of the 967 blanks there was a failure on the part of the breeder to record the *cow's* age.

The more important biometric constants from this table are shown in Table 9.

TABLE 9.

Showing the Chief Physical Constants for Variation in Age of Breeding Cattle.

CONSTANT.	*a.* Bulls used as breeders.	*b.* Cows which have dropped one or more calves.	*c.* Heifers bred for their first calves.	*d.* All females (*b*+*c*.)
Mean or average age	2.921 ± .037 yrs.	5.553 ± .075 yrs.	1.614 ± .024 yrs.	4.809 ± .070 yrs.
Median age	2.589 ± .047 yrs.	4.875 ± .093 yrs.	1.652 ± .030 yrs.	3.975 ± .087 yrs.
Third quartile age	3.844 ± .047 yrs.	7.242 ± .093 yrs.	2.103 ± .030 yrs.	6.765 ± .087 yrs.
Standard deviation	1.722 ± .026 yrs.	2.952 ± .053 yrs.	.462 ± .017 yrs.	3.080 ± .050 yrs.
Coefficient of variation	58.94 ±1.18 %	53.16 ±1.19 %	28.64 ±1.14 %	64.05 ±1.39 %

These tables present a number of points of interest to the breeder of cattle. We note:

1. The average age of the herd bulls used to sire the 967 calves included in the statistics was just under three years. The median age of these herd bulls was approximately two and a half years. This means that one-half of the calves were sired by bulls *under* two and a half years old at time of service Seventy-five per cent of all the calves (as shown by the third quartile age) were sired by herd bulls less than about three years and nine months old at time of service. Less than 15 per cent of the calves were sired by bulls five or more years old. Let us consider for a moment what these facts mean. A bull must be at least three years old before the breeder can possibly have had any opportunity to test the milk producing capacity of his daughters. *But 58.9 per cent of all the calves covered in these statistics were sired by bulls under three years of age.* In other words, in the breeding operations of a large number of Maine's most progressive and wide-awake breeders (for such the cooperators in this record scheme are) more than half of the calves produced in a given interval of time are sired by bulls about whose ability to transmit milking qualities absolutely nothing definite can by any possibility be known. It is doubtless entirely fair to assume that essentially the same conditions regarding cattle breeding methods obtain in other places generally. Is it remarkable that progress is so slow?

2. In the female half of the herd the conditions are better. We see that if we exclude heifers bred for their first calves, the average age of the breeding cows is approximately five and a half years. This is an age when, on the average, cows are nearly if not quite at their best as regards milk production.

3. Out of 878 calves, 166, or 18.9 per cent, were the first calves of heifers. The average age of these heifers when successfully served for these first calves was approximately one year and seven months. Three-quarters of the heifers were successfully served for their first calves before they were 2.1 years old.

4. THE RELATION OF THE TIME OF SERVICE TO THE SEX RATIO IN CATTLE.

One of the primary purposes for which the cooperative cattle breeding record plan discussed in the preceding sections was undertaken was to get comprehensive statistics to show whether any definite effect on the proportion of male and female calves born could be observed when service occurred at different times in the heat period. Work done at the Station some years ago suggested that when service occurred very early in heat there was likely to be born a larger proportion of heifer calves, and when service occurred very late in heat there was likely to be born a larger proportion of bull calves. With the hope of getting a very much larger amount of more precise data on this point, and demonstrating whether the suggestion of the earlier results was correct or not, the cattle breeding record plan was inaugurated.

A considerable mass of material on this point has accumulated, but it is thought desirable to wait until another year's records are in hand before reporting further in regard to the matter.

5. CYSTIC DEGENERATION OF THE OVARIES.

During the past year there has been published the results of the study[11] of an interesting case of a fairly common cause of sterility in cows. A pure-bred registered Ayrshire cow, named Dorothy of Orono (23010), belonging to the University of Maine, produced three calves, on dates as follows: September 17, 1909, September 10, 1910, February 24, 1912. When 3 years and 327 days old Dorothy of Orono was started on an official milk test of one year, which she completed with a record of 11463 lbs. of milk, carrying 417.71 lbs. of butter fat. For this record she was entered as No. 426 in the Ayrshire Advanced Registry. Her complete lactation record is shown in Table 10.

11Pearl R. and Surface, F. M. Sex Studies, VII. On the Assumption of Male Secondary Characters by a Cow with Cystic Degeneration of the Ovaries. Me. Agr. Expt. Stat. Ann. Rept., 1915, pp. 65-80.

TABLE 10.

Lactation Record of Dorothy of Orono.

LACTATION PERIODS.	Days in milk.	Pounds of milk.	Pounds of fat.	REMARKS.
Sept. 21, 1909- Aug. 4, 1910	316	7,840.6	293.62	
Sept. 11, 1910-Nov. 25, 1911	440	12,426.4	450.75	Lactation in which Advanced Registry record was made.
Feb. 26, 1912-March 24, 1913	391	7,016.8	253.92	Cow was sick for some time during this period.

After March 24, 1913, the cow never gave any milk. The udder rapidly shrunk to a very small size and the animal began to show the external characteristics of a bull. This change was very slight at first but soon became much more marked. *After a lapse of 8 months the general external appearance and the behavior of the cow were like those of a bull to a remarkable* degree. The neck had become thickened in its posterior parts, and had developed a well marked crest, as is characteristic of a bull. If the cow had been so screened that only her forequarters and neck were visible any observer would have unquestionably pronounced her a male. The assumption of male characters in these regions was complete and perfect. In the hindquarters the change from characteristic female conformation in the male direction, while less striking than in the anterior parts, was still clearly evident. The udder shrank away to a very small size. The hips and rump took on the smooth rounded, filled-out appearance which is characteristic of the bull but not of the cow.

The cow was slaughtered on February 18, 1914. Autopsy showed as the only gross abnormality a simple cystic condition of the ovaries. Under the microscope these cystic ovaries differed from the normal cow's ovary in but one essential respect, namely, that they had no corpora lutea.

A corpus luteum, or yellow body, is a peculiar cellular structure which forms in the ovaries of animals which give milk, where an ovum has been discharged. This yellow body pours into the blood a chemical substance, which is known to have the function (1) of preventing the ovary from discharging any more ova, and (2) of preventing the animal coming in heat during the course of pregnancy.

The case described presents for consideration certain definite and clearcut results bearing on the problem of secondary sex characters. This cow had been a perfectly normal female and had performed all the reproductive functions, both primary and secondary, of the sex. It later assumed certain of the secondary characters of the male, both in respect of structure and behavior, with perfect definiteness, and, so far as the characters concerned go, completeness. The outstanding, and so far as could be determined, the only significant, anatomical and physiological difference between the ovaries of this abnormal cow and those of a normal one, consists in the fact that the former lacked any of the tissue normally composing the yellow bodies or corpora lütea.

Cystic degeneration of the ovaries is one of the commonest causes of sterility (failure to breed) in cattle. No cure for it has been discovered up to this time, except a form of surgical interference, which has been reported from Switzerland as successful in a percentage of cases when applied by a skilled veterinarian. This is, however, not a practical treatment for the ordinary farmer. The results of the present study suggest, as worthy of trial, the administration of corpus luteum substance as a therapeutic measure in these cases of cystic degeneration. There is some reason to believe that if the case were not of too long standing a cure might be effected by this means. It must be understood that in the light of present knowledge this is merely a suggestion, *and is not put forth as a guaranteed cure in any sense of the word whatever.* It would, however, seem worth a trial. The use of this material for somewhat analogous conditions in human medicine has met with marked success in some cases.

Some experiments along the line suggested are being carried on at the present time.

V. The Inheritance of Milk and Butter Fat Producing Ability.

Work on this line has proceeded during the year along the two general divisions outlined in earlier reports, viz., (a) the analysis of existing records, and (b) breeding experiments along Mendelian lines.

(a) ANALYSIS OF MILK PRODUCTION RECORDS.

In this direction the outstanding event of the year is the transference and analysis of the production records of the Biltmore Farms herd, of Biltmore, N. C. Through the kindness of the manager, Dr. A. S. Wheeler, we were given permission to copy and make any use we wished of the records of production of this remarkable herd of registered Jersey cattle. In January, 1915, John W. Gowen, then a member of the staff of the Department of Biology, went to Biltmore and transcribed the records. In this work every facility was accorded him by Dr. Wheeler, to whom we desire to extend our heartiest thanks for this aid. After returning to the laboratory, Mr. Gowen spent the remainder of the academic year in the reduction of these records. As a result of his very efficient and painstaking labors we have now in shape for study probably the most complete and satisfactory set of records for the study of the inheritance of milk production anywhere in existence. They are far superior to advanced registry records because they include records not alone of the good cows but of *all* cows, good, bad and indifferent.

(b) MENDELIAN EXPERIMENTS WITH CATTLE.

As has been pointed out in earlier reports, definite cross-breeding experiments, carefully controlled, are absolutely essential to the study of the problem of the inheritance of milk production. The experiments along this line with the herd of the University of Maine are proceeding satisfactorily, if of necessity somewhat slowly. In due time we hope to have a considerable number of animals in the cross-breeding experiments from which may be tested by Mendelian methods, the way in which milk and butter fat production are inherited when a high producing and a low producing breed are crossed together.

Table 11 gives a conspectus of the animals which have so far been born in the Mendelian herd.

TABLE II.

Calves which have been Produced in Cross-Breeding Experiments to December 1, 1915. F_1 Generation.

Calf No.	Sex.	DROPPED.	Sire's Name and Registry Number.	Breed of Sire.	Dam's Name and Registry Number.	Breed of Dam.
0	♂	March 28, 1914	Lakeland's Poet (102603)	Jersey	Delva Johanna De Kol (146774).	Holstein-Friesian.
1	♀	April 5, 1914	Laleland's Poet (102603)	Jersey	Pauline Posch (81048)	Holstein-Friesian.
2	♀	November 22, 1914	Delva's University De Kol (133910)	Holstein-Friesian	Canada's Creusa (44386)	Guernsey.
3	♂	December 10, 1914	Johanna Lad Manor De Kol (41913)	Holstein-Friesian	Flora's Golden Poetess (264927)	Jersey.
4	♂	January 20, 1915	Taurus Creamelle Hengervelа (98482)	Holstein-Friesian	Rosalie (4887)	Jersey.
5	♂	January 24, 1915	Kayan (167617)	Aberdeen-Angus	Dot Alaska (29353)	Ayrshire.
6	♂	February 8, 1915	Taurus Creamelle Hengerveld (98482)	Holstein-Friesian	Maple Grove Netta (29307)	Ayrshire.
7	♂	February 13, 1915	Kayan (167617)	Aberdeen-Angus	Ruth 8th (4457)	Jersey (M. S. J. H. B.)
8	♂	March 23, 1915	Kayan (167617)	Aberdeen-Angus	College Creusa (25661)	Guernsey.
9	♂	March 26, 1915	Kayan (167617)	Aberdeen-Angus	Pauline Posch (81048)	Holstein-Friesian.
10	♂	April 7, 1915	Kayan (167617)	Aberdeen-Angus	Creusa of Orono 3d (34228)	Guernsey.
11	♀	April 21, 1915	Lakeland's Poet (102603)	Jersey	Delva Johanna De Kol (146774).	Holstein-Friesian.
12	♀	April 22, 1915	Taurus Creamelle Hengerveld (98482)	Holstein-Friesian	College Gem (40037)	Guernsey.
13	♂	May 4, 1915	Columbia's Fox (126386)	Jersey	Eventime 4th (155526)	Aberdeen-Angus.
14	♂	June 6, 1915	Taurus Creamelle Hengerveld (98482)	Holstein-Friesian	Flying Fox's Flora (274051)	Jersey.
15	♀	October 23, 1915	Lakeland's Poet (102603)	Jersey	Hearthbloom (147141)	Aberdeen-Angus.
16	♀	October 27, 1915	Kayan (167617)	A erdeen-Angus	College Ruth (4895)	Jersey (M. S. J. H. B.)
17	♂	November 8, 1915	Kayan (167617)	Aberdeen-Angus	Rue Victoria (273096)	Jersey.

The heifer No. 1 has been bred to the bull No. O, to produce an F_2 calf. The other F_1 heifers will be bred as soon as they are old enough.

QUESTION: Did I understand that in the latter part of the heat the off-spring is more likely to be female?

DR. PEARL: Some people think so. My general opinion is the other way.

QUESTION: Did you mean to say that heifers with a second calf produce more milk than with the first?

DR. PEARL: That is probable. We have examined upwards of one thousand cows, and in all cases there is a rising from the first up to the sixth, and then it varies a little, some breeds reaching the maximum later than others. It might not be true in every herd; there might be a difference in the herd, according to the age at which they were brought to freshen the first time.

QUESTION: It has been my experience in a herd of 20 cows, that in many cases, at the second lactation, the quantity is less than the first. I breed at about two years of age.

DR. PEARL: The average age at which heifers are bred the first time is an average of one year and seven months old. There are quite a considerable number, however, who do not breed until they are three years old.

QUESTION: You spoke of another thing, about cows running very regularly as to the amount of milk they give. I have found some would hardly pay for their keeping, and then other years, would give more than double as much.

DR. PEARL: I meant to say that on the average they will give more the second year.

A litter of mule foot pigs.

FUNDAMENTALS OF DAIRYING.

FRANK H. STADTMUELLER, Dairy and Food Commissioner of Connecticut.

These three, in number, are as follows:

A. Conversion of bulky and crude materials into more concentrated and valuable products.

B. Upkeep of fertility of the land.

C. Relation of milk supplies to public health.

The first of these principles was developed in the pastoral stages of farming and has ever since, as then, in connection with the production of meat and wool, provided the only known method of marketing the growth of all grazing lands. The system of harvesting hay, etc., for the purpose of carrying the stock thus needed during the winter, periods of drought, etc., was developed and is today maintained, primarily, for the purpose of conserving the growth of pastures.

The value of the second principle—upkeep of fertility—followed later and was gradually developed to its present high state of application, so that now the stand of stock maintained in any country is one of the best and quickest methods of determining the existing status of farming therein.

A brief digression at this place is permissible to review the remarkable changes in farm practices forced upon the industry of farming throughout New England by the opening of the west. Prior to that time, the upkeep of fertility was, with minor exceptions, met by the large diversified stock maintained, represented by cattle, cows, sheep and swine. This provided an option for farmers. They could choose either the production of beef, wool and mutton, pork or milk as a means of concentrating their crude products, and still maintain the soil fertility.

With the opening of the west, this option was removed and they were gradually restricted to the production of milk, which resulted in a yield of milk vastly in excess of the needs of the community. The keen competition thus developed, in connection with the fact that but two fundamentals of dairying were then known, inevitably resulted in a very poor milk when contrasted with milk of the standard now deemed desirable.

The antiquity of these two fundamental factors was such that in recent times they have been rarely considered and their presence, if at all recognized, was reflected by a subconscious feeling rather than a keen realization of the great economic force they exert upon farming. This was so as they were gradually superseded by more refined problems, such as the breeding, feeding, etc., of cows, which, although of vast importance and productive of great advances, nevertheless are not strictly fundamental factors. Thus their loss to view has been of little significance and little or no injury resulted therefrom so long as the fundamentals were but two in number.

However, with the discovery of the third—the relation of milk supplies to public health—they again occupy the foreground and should always receive due consideration in all discussions seeking to establish and define means and methods for the production of wholesome and reasonably safe milk supplies. To do otherwise must inevitably result in unjust criticism of dairymen, for, bear in mind, up to the discovery of the third fundamental factor, first sensed about 25 years ago and still not well defined, the problem of the dairymen was but twofold, viz., to concentrate crude products, and make manure.

That this task was well done is abundantly proven by the great progress made in breeding, feeding and milk yields. Stress upon these two factors, however, is now imperative because the third factor projects new conditions and methods which can be only attained through additional risks, labor and expense.

Furthermore, it is desirable to dwell upon these facts for the reason that the discussion of milk supplies in relation to public health must, in the nature of events, be led by sanitarians and medical men who, as a rule, know little of the great economic importance of the two fundamentals first mentioned. Nor should this be placed to their discredit as their training has not embraced this field of investigation. Consequently the zeal displayed in defining the proper spheres of activity to be pursued, and because of the novelty of the task, has led to the projection, and in some cases advocacy of efforts and actions, which, if persisted in will seriously menace the future of dairying. A warning of the effect of extreme measures abounds in the decline in number of cows in Massachusetts and Connecticut during the past fifteen years in the face of a decided increase in population. However, this decline of cows should not be entirely attributed to the reasons just given. Other factors, such as increase in the yield of milk per cow and increased consumption of condensed and evaporated milks have contributed thereto.

Thus we perceive the great duty devolving upon dairymen intelligently to keep before the public the prime importance of the two factors first mentioned. That is the concentration of bulky and crude products and upkeep of fertility.

Although no distinction in time was given regarding the occurrence of the first two fundamentals, obviously there was an interval of many centuries ere the presence of the second was discerned as this could first begin to assert itself only after the soil depletion of land in the vicinity following fixed settlements and abodes became apparent. It is therefore conceivable and proper to point out that farmers, where this occurred, were confronted with just as serious a problem to which they had to adjust their practices as now confronts us. Its manifestation and expression was simply in a different direction. The net result was the same, viz., added expense. In fact, despite the antiquity of this second fundamental, its demands still have to be heeded in many sections of this country, particularly throughout the former fertile prairies of the west. This situation clearly indicates that the time is rapidly approaching, if not already here, when meat can and will be again successfully produced throughout New England.

As was previously stated, the third and last fundamental is still undefined in its application. That is, although the possible relation milk supplies may bear to public health is universally conceded, divergent opinions exist as to means and methods to be employed to attain the desired goal. The question, therefore, is largely an educational one. New problems have been projected which will undeniably increase the cost of milk production. But the art of producing the required milk must first be mastered and applied ere a proper recognition of the added burden imposed thereby upon dairymen can be expected or will be made. This is a fundamental principle of all operations of trade. A product must be first made ere a suitable demand and market therefor can be reasonably expected.

Many theories and schemes have been devised for this purpose in recent years, but the practical working limitations still remain somewhat uncertain. What has been done is now sufficiently clarified to admit grouping the same under three heads, as follows:

1. Stable and dairy inspection.
2. Pasteurization.
3. Grading of milk.

It is safe to assume sufficient familiarity abounds regarding these to dispense with elaborate detailed statements thereof. Such discussion will, therefore, be avoided as much as possible.

Inspection is the most important measure, although derided on many sides and in the last few years seemingly belittled by investigations which have tended to display a rather insignificant relation, if any, between milk produced under what are usually conceived as sanitary and unsanitary conditions, the fact nevertheless remains that rational inspection accompanied by proper instructions from suitably qualified and authorized officials still embraces the most efficient means of effecting the desired improvements. This is so because the whole movement is one of education and training more than any other. In this way producers have all the advantages derivable from personal contact and discussion with the instructors, inasmuch as the legitimate sphere of stable inspectors is nothing more or less than one of instruction. Inspection as at present performed does not, perhaps, develop this conception of its function. This is readily accounted for by the comparative newness of the work. It was necessarily inaugurated at many points, men poorly qualified, either temperamentally or by training, were employed as inspectors and the methods, standards, etc., advocated, were not clear and well defined. Such conditions if continued can have but one termination, viz., distrust and ridicule, which we well know has resulted in numerous sections.

Efforts to overcome these obstacles resulted in the score card, which had an additional advantage in the subtile coercive power vested therein by the publication of the scores of any particular locality. Score cards are now in favor in many sections. Their final adoption and use is still somewhat uncertain. Where score cards are used they should never be published, although failure to do so will rob them of their coercive function.

In cases where a single high rating occurs, more as a result of an accidental combination of circumstances rather than intelligent action, and the average of several scores for the same stable is low, it is asking too much of human nature to remember any other than the one high score, when advertising or dwelling upon the value of this particular product. In brief, they lack permanence and stability, two essential qualities of publicity. Furthermore, non-essentials are apt to be over emphasized and essentials to be underrated. This is particularly true with the U. S. score card—the one in most general use. Bearing in mind the object of score cards, viz., protection of public health, any system which fails emphatically to emphasize the water supply, and health of employees and cows, must necessarily be open to criticism. The multiplicity of detail in the U. S. Card prevents this.

Moreover, inspection has been unsatisfactory and deficient because of the method in which it has generally been developed. It has usually originated and is still generally directed by boards of health of different cities or localities, each proceeding in its own way, employing various methods and standards. Thus it becomes apparent that the conception of inspection as an educational movement has been submerged and lost to view by these chaotic and uncorrelated efforts. Progress will be unsatisfactory so long as the educational phase of the problem occupies this position. Proper understanding can be hastened and become firmly established by recognition of the defects heretofore mentioned and the standardizing of the work through centralization of authority. This principle was recognized and approved at a conference of delegates appointed by the governors of the states from which milk was sent to New York, held at New York several years ago under the auspices of the New York Milk Commission, where it was decided that inspection should be state-wide rather than by cities or towns. As one of the delegates to that convention, I voted in favor of such a recommendation, which action has recently been supported by considerable observation and experience in the administration of one of the inspection provisions of Connecticut.

The details of such efforts, such as frequency with which inspections should be made, method of taxing costs thereof, etc., are still to be worked out. It is safe to state at this time that inspections must be made with sufficient frequency in order that the effect of previous work shall not be dissipated and *lost*. These details offer no serious obstacles and the work, when once well comprehended, can be readily and properly organized. In my opinion, inspections directed primarily as an educational effort and supplemented only by police regulation in urgent cases, and directed from one point in each state, will prove to be one of the most efficient means of meeting the problems projected by the third fundamental factor. Any other means of arresting many forms of infection at their source of origin is inconceivable, and it is well known that most of the difficulties liable to develop in milk originate at the source of its production, viz., in the cow stable. A plan has been recently formulated to reduce the inspection work if not ultimately supersede it. This scheme seeks to arouse and stimulate interest in the production of clean milk by offering prizes therefor. This is now on trial in Massachusetts where it is reported as being successful. Although such a system may be moderately satisfactory during the transitional period, now present, the principle is wrong. Proper and enduring stimulation can only come through economic recognition for the service rendered and expressed by systematic, regular and adequate remuneration commensurate to meet the added burdens imposed to safeguard milk supplies.

PASTEURIZATION.

Soon after the presence of the third fundamental was sensed, efforts to meet its needs were naturally directed towards stable improvements. Wherever such efforts were undertaken it soon became apparent that the desired changes found necessary in stable methods and practices would involve a large outlay of money, and daily increased cost of production. After years of somewhat superficial investigations prompted by fear of the threatened advance in the price of milk, coupled with unwillingness to admit or concede that milk so produced was correspondingly worth more, directed attention to the devisement of shorter paths to righteousness and proportionately cheaper than those obtainable by stable improvement. This line of work first resulted in the recommendation that milk be sterilized. After some years of trial this was found to be unsatisfactory and was finally superseded by pasteurization as the only practical and safe way to provide wholesome milk supplies. The trend towards pasteurization is particularly strong at present in all large centers of population. That pasteurization, as now usually performed, does have a tendency to prolong the commercial life of milk, must be conceded. This is accomplished by the effect such treatment of milk has on delaying its souring. Its merit as a factor in the protection of health still remains somewhat uncertain. The interval of time during which it has been in use has been too brief to warrant the formation of definite *opinions* thereon. Present indications are that as a life saving proposition it will prove to have been over-rated, although it will be employed to a considerable extent because of the commercial advantages previously stated. When the time that elapses between the production and distribution exceeds 24 hours, these advantages become inviting and rapidly enhanced as the time limit increases. Hence, pasteurization will first be employed in such communities where much of the milk used, necessarily, at present, comes from rather remote points. From the commercial point of view, there is no advantage apparent in pasteurization of milk where the milk can be delivered to consumers within 24 hours of its production.

There are certain grave objections to pasteurization that will ultimately demand attention. First, the logical effect thereof is to place a premium upon carelessness and filth. That is, this method is but the culmination of efforts seeking to evade the added costs that inevitably must result from stable inspection and the changes in practices and methods such inspection will impose. Attempts to reduce costs are always laudable, but the method and ultimate effect involved should not be overlooked.

Second, as at present applied, a primary principle of pasteurization, particularly when viewed as a health measure, is ignored. This is, that if milk is to be pasteurized, it should be done immediately after the milk is taken from the cows, and not 24 to 72 hours thereafter, as is now the case.

Third. The difficulty of systematically enforcing pasteurization where it is required.

Grading Milk.

That milk should be graded is admittedly desirable. Moreever, grading should be of a two-fold nature. Some distinction of food nutrients and another regarding sanitary qualifications appear desirable.

This is now being tried in some places, notably in New York. The classification now generally attempted embraces five grades, viz.: Grade A—pasteurized and unpasteurized. Grade B—pasteurized and unpasteurized. Grade C—pasteurized. The difference between the Grades A, B and C, is mostly one of cleanliness as determined largely by the bacterial infection of each. Similar objection exists respecting grading, as the last one mentioned regarding pasteurization. In fact, the police supervision required by grading is so stupendous as to raise grave doubts regarding its practicability. The daily detail essential to the proper classification of the milk offered from day to day will be so great that the cost of the supervision thereof, in order that the grading is properly and systematically performed, is at present prohibitive. Consequently, the work is liable to be indiffefently performed and inaccurate.

From this brief review of this important problem, stable inspection, despite its present bad repute, appears to be the most rational method to be employed in determining the proper position in the field of dairying of the third fundamental. In conclusion, it is proper to point out that among dairymen there are many misfits—men, who by lack of training, proper sympathy, etc., are disqualified from ever attaining any degree of proficiency therein. Furthermore, there are many to whom the conditions projected by the addition of the last fundamental, milk supplies in their relation to public health, is intolerable. Unfortunate as these situations may be, and worthy of much sympathy and regret, nevertheless, that these abound is nothing more or less than occurs daily in all walks of life. Nay, even today, in those sections where the second fundamental, viz., upkeep of fertility is just beginning to assert itself, there are quite a few who, rather than bow down to its dictates, pack up and seek either new lands or embark upon other ventures. Likewise many who have been dairymen will gradually cease to be such under the new regime now confronting us—beef. In fact, the whole process can be simply expressed as one of readjustment, both of individuals and practices. This will necessarily be slow because of the magnitude of the interests involved, both numerical and financial. Moreover, the full position of this fundamental factor will not have been fully determined until consumers have also readjusted their domestic expenditures to accord with the increased costs imposed upon dairymen.

But, dairymen, bear in mind, a product has first to be made ere a suitable market and price can be created therefor.

PRIZE ESSAYS.

Prizes were offered by the Maine Dairymen's Association, the same as in 1914, for the best three essays written by students taking agricultural courses in secondary schools in the state—subjects selected by the association. First prize, gold watch; second, silver watch; third, fountain pen.

These prizes were won by Ramon Strout of Greely Institute, Cumberland Center, Chester H. Bean of Maine Wesleyan Seminary, Kent's Hill, and Jesse Bangs of Freedom Academy.

The presentation was made by Dr. L. S. Merrill, Secretary of the Maine Dairymen's Association.

The essays will be found in the following pages:

WHY SHOULD AGRICULTURE BE TAUGHT IN OUR SECONDARY SCHOOLS?

RAMON STROUT, Cumberland Center.
(Prize Essay.)

Agriculture, the oldest science known, has but recently been introduced into the course of study of any secondary schools. A few years ago the necessity of preserving the fertility of the soil led the government to establish experiment stations and to conduct research work, the result of which has been the publication of a large number of bulletins and text-books on the various phases of agriculture. Their books and bulletins have been used for instruction in many secondary schools and agricultural colleges of the nation. Our question for discussion is, "Why should agriculture be taught in our secondary schools?" I believe that for four reasons agriculture should be taught in our secondary schools. First, it helps to keep the boys on the farms; second, it teaches them scientific methods of agriculture; third, it benefits the community; fourth, it benefits the school.

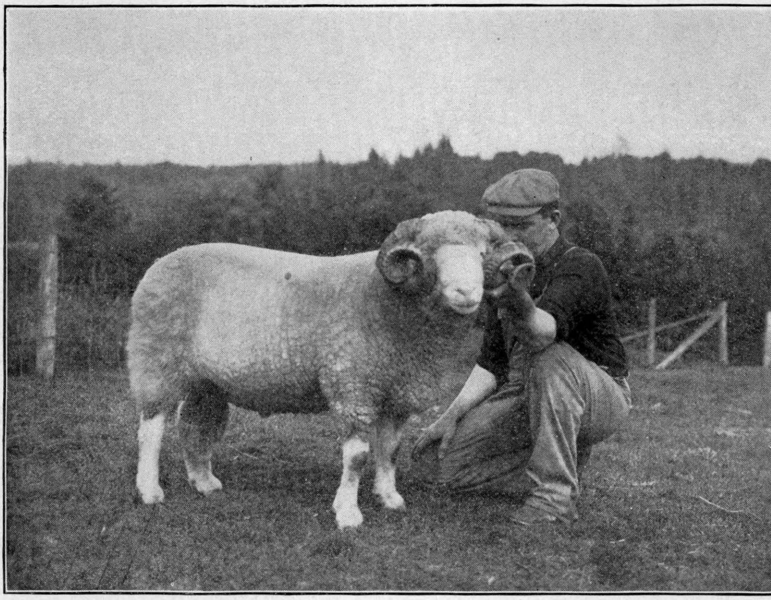
Of late years there has been a great rush of boys from the farm to the city. The abandoned farms all over the state show this. The stirring life and seemingly high wages attract them more than the slow life on the farm, and they do not stop to consider that it will take all they can earn to barely support them in the city. The average boy brought up on the farm sees in life nothing but labor. To show him how interesting farm life can be is one of the opportunities of agricultural teaching. This opportunity is being improved by practical experiments which illustrate things learned in the text-books. We have a room in the basement of our school building which we use for an agricultural laboratory. There we have materials for performing experiments with the different kinds of soil, and equipment for testing milk and cream. Last year the class studying domestic animals had the privilege of judging the cows of many pure bred herds. These experiments awaken the interest of boys in farming. If agriculture is taught throughout the state, I believe we may hope soon to see the abandoned farms once more occupied.

The second reason is, it teaches the boys scientific methods of agriculture, their importance, and their application to the home farm. The older farmers are slow to accept modern methods, preferring to do things the way they have always done them. They hate to pay out money for farm improvements, not realizing that they must spend money to make money. Why is it that a city business man will buy a farm and will sometimes be more successful than the farmers around him? It is because he knows the value of modern methods and will grow two blades of grass where his neighbors grow but one. He has profited from the experience of those who have investigated the best methods of agriculture. The boy studying agriculture in high school has an opportunity to learn these methods. For example, the class studying orcharding in our school had the privilege of picking, grading, and packing apples under the teacher's direction in a nearby orchard. The practical work that the boys get in school in this way shows them that in order to succeed they must learn to do things well. Thus they form a desire to raise some product on their home farm and strive to follow the best methods in doing so. In this way they learn to specialize.

The third reason is that it helps the community. The agricultural school leads a greater number of boys to stay on the farm and thus helps the community by increasing the number of useful citizens. For are not the boys of today the citizens of tomorrow, and where are better or more useful citizens to be found than among the farmers of a community? Agriculture in high schools also leads to the establishment of associations which are beneficial to the farmers. Our instructor in agriculture has just started a Cow Test Association which has over twenty members, already. Although the association is founded primarily for testing the milk produced by the herds of its members, it will later work out feed standards. Its members will also eventually cooperate in the purchase of farm supplies. A Farmers' Extension School will be held at the school building during the vacation in December. Will not the community interest aroused in this way tend to vastly improve farm conditions? Who can estimate how much financial assistance the secondary school, through its agricultural instruction, may be to the farmers of the community?

The fourth reason is, that it benefits the school. Farming communities are slow to see the value of a school offering purely classical courses, whereas, they will see visible proofs that a school offering an agricultural course is benefiting them and will tender it their support. Boys, too, who intend to farm would rather go to an agricultural school. I know at least two boys in my own town who would probably have attended other schools, had not Greely Institute been the only school within a practical distance which offered instruction in agriculture.

In the school garden the community sees the methods taught actually applied. This fall we ploughed about one-half an acre on the school campus and sowed one-quarter of it to winter rye which we shall plough under in the spring. Next spring we shall plant the remainder of the ploughed ground to early vegetables which we shall take turns in marketing, it being as important for a farmer to know how to market his crops as to grow them. These experiments in the school garden, in the laboratory, and on the farms of the community, make the course in agriculture seem practical and interesting to the students. They serve as an attraction to prospective students. They increase the interest of the alumni and of the community in the school. For these reasons I believe agriculture should be taught in our secondary schools.



Horned Dorset ram two years old.

Hampshire Down ram and ewe.
From Long Branch Farm, Bowdoinham.

WHY SHOULD AGRICULTURE BE TAUGHT IN OUR SECONDARY SCHOOLS?

Chester H. Bean, Kent's Hill.

(Prize Essay.)

Agriculture within the past few years has become one of the important subjects taught in secondary schools. It is only recently, however, that the benefits derived from teaching agriculture in secondary schools have been realized. Before the twentieth century very few secondary schools offered a course in agriculture. This is due largely to the fact that the question, "Why should agriculture be taught in our secondary schools?" has seldom been clearly answered.

An education in agriculture, equal in thoroughness to that given in other subjects in secondary schools, is a stepping stone to a higher education along agricultural lines in college. Such an education gives the student sufficient knowledge of the scientific side of farming to enable him to enter on the advanced work of college without loss of time. This education is especially valuable to the city student for it gives him an understanding of the principles of farm work, which enable him to enter the college work on a fairly equal footing with the student from the farm.

Mathematics and languages have been taught for hundreds of years, largely for the benefit which they give the student by helping him to remember and to make the student broader minded by making deep and logical thinking necessary. Why should not agriculture be taught for the same reason? It is seldom denied and often affirmed that the actual work of agriculture, or agricultural study, requires as keen a mind as any line of business or any study.

An education in agriculture is beneficial to every student, whatever his future occupation may be, for it is an undeniable fact that the more subjects a person understands the better he enjoys life. More than this, such an education benefits the student by showing what he must face, for no education shows plainer than an agricultural education what a complex thing any occupation will be when once a career is started.

A secondary school education in agriculture gives the city man something in common with the farmer, for he understands something of the farmer's work and difficulties. With this knowledge, an intelligent city man no longer ridicules the farmer, for he realizes that the farmer does and must have at least an average intellect if he is making a success on the farm.

If city men, as a whole, had such an education it would undoubtedly lessen the division between the country and the city. This would pave the way for cooperation between the farmer and the consumer of farm produce, which is an important factor in reducing the cost of living and of making the farm pay.

It might be said that agricultural education might well be left to the colleges, but only a small part of secondary school students attend college; and some of the secondary school students might not go above the graded schools were it not for the agricultural courses.

Agricultural courses increase the attendance of secondary schools, for some students will go to a school where they may receive a classical and an agricultural course at the same time, who would not spend two to four years obtaining one course alone in schools which offer only one course.

Finally, agriculture is a direct benefit to the student who wishes to become a farmer. Few farmers understand the figures on the bags of the fertilizers which they buy, well enough to find by such figures the pounds per ton of the whole of each constituent. Fewer, still, could explain the analysis on the feed sacks, in which they often buy feed which they do not need. Few farmers understand the reasons clearly which make cultivation of crops so beneficial.

A secondary school education in agriculture helps the farmer to understand the chemical side of farming. He learns to study the analysis of fertilizers and grains. He understands the average analysis of crops which are commonly grown for feeding. He learns to work out rations from the analysis of various feeds. The would-be farmer learns the chemical side of soil cultivation and of plant growth. He learns the physical side of crop production, for he learns when to plow, depth to plow and cultivate and many similar operations. An agricultural student learns the improved methods for many things, like corn selection, seed testing and the use of machinery in all crop production.

Of course it is possible for the farmer to learn these things without entering a school building, but every subject may be mastered by the student without the school. Schools were organized for the purpose of more quickly passing the knowledge of one to the next, and for that purpose the school is as valuable to agriculture as to other subjects.

Agriculture benefits the student who plans to be a farmer, in teaching him how to study or read agricultural publications. He learns to ask the reason for results obtained from new methods, or for the variation of results under apparently the same conditions. He learns to ask proof for statements before believing them. He learns to apply the experience of other men to his own conditions of location, soil and climate. He learns to study agricultural department bulletins and books and papers on agricultural subjects, to learn newly discovered facts.

There is no quicker way for a young farmer to get in touch with the world of agricultural research than through the course in agriculture in secondary schools. He may become acquainted personally with leaders in agricultural work, or he at least hears speakers of that type. He learns that the agricultural department is really doing something and he naturally wishes to hear the speakers who come within reach of his home from time to time.

Thus the farmer, who has a secondary school education in agriculture, looks for help in his work to agricultural bulletins, agricultural papers and books, and the men of the agricultural department.

ADVANTAGE OF AGRICULTURE IN SECONDARY SCHOOLS.

JESSE BANGS, Freedom.

(Prize Essay.)

Agriculture in secondary schools is a great boom to any community and has not been introduced until late years. In Michigan, in 1911, but six schools offered courses in agriculture and in Massachusetts, the same year, only eight schools taught this branch. Many states have seen their error and have followed the example of their neighbors. The colleges have also taken agriculture into their courses.

The last few years has decided a new course for agriculture; from now on farming is going to be carried on scientifically under better and improved methods. The farmer of tomorrow is going to be a business man and he is required to be educated in several branches, so as to be able to cope with any problem which may come before him. In a high school, while a boy is taking agriculture he is also taking other studies, such as English, mathematics, history, etc. The people now are just beginning to pick up the "Back to the Farm" movement, probably due to the teaching of agriculture in secondary schools. The farmer of tomorrow is also going to be the aristocrat of the country, partly on account of the invention of the automobile and other machinery which enables him to "see the country," and to do his work without much hard labor. But mostly, in that the boy, when entering high school, will become enthusiastic over the agriculture project and will take that course and later enlist in the ranks of the world as a scientific farmer.

Some schools have a school farm where experiments can be carried on and where the boys can work their board and also learn more than they would from what is in the various books, but the majority of schools have no farm and the students carry on their experiments at home. An example of this is at Freedom Academy where agriculture is taught as well as English and college preparatory, also.

The first year is devoted to a study of the soil and also of the different fertilizers. This gives the student a base on which to build his agricultural knowledge. The second year is taken up in the study of poultry, cattle, sheep, horses, swine, etc., and the feeding of the different animals. The second year is perhaps the most important of all, because the student just begins to get an insight in the work. The third year is passed in studying farm crops, fruit growing and intensive farming. Next comes the fourth year which sums up the whole in the study of farm management. This last year involves a rather hard question to be answered, because of the various conditions which some farms are in.

In a community where there is a high school or academy offering a course in agriculture, there is most always a large amount of competition. The average farmer of today did not have a chance to study the science of farming, but their sons bring home to them the fact that scientific farming is not altogether theory, but also practical. It starts a thrill in the heart of the farmer of yesterday and he begins to open his eyes and take an interest in the practically new science which the state department and the local school open up to him.

In a locality where there is no school the farmer does not have a chance to see the results of farming scientifically, except from reading magazines, and he will take no stock in them, because he will say, "Father never did that, and I guess he raised as large crops as they do at that experiment station." His statement is true in some respects: If a man has plenty of sound common sense he can reason things out, although he will be ignorant of the manner in which the fertilizers unite with the elements in the soil and form plant food, and also to ascertain when some of the elements are lacking. The boy who grows up in such a community will want to go to the city and leave the farm, on account of its being rather a bore and because he does not get the thrill of getting up early in the morning and out into the fresh air, of getting the cows milked, the horses harnessed and on his way to town with the milk or other farm products.

In Waldo county, in this state, there are a number of schools where agricultural courses are taught. The boys have become interested in potato and corn clubs which are being supported by the University of Maine. In a recent potato club which was formed last winter it showed that an agricultural training was of great value, as the winners of the high prizes were students in agricultural schools.

Maine was one of the first states to advocate scientific farming and to put agriculture in secondary schools. Maine is not first in the production of crops, probably on account of climatic conditions and the intensive plan of farming, but she has taken great strides of late towards breaking world records for the production of some crops.

The one great purpose and sole aim of all industries is to thrive and make money. That is just what is taught in these schools: What crop to raise, and how to raise it to the best advantage for the most profit. As agriculture seems to be an industry which thrives in any locality, it would seem to be better for each boy living on a farm to stay at home, where he can be free from drudgery, enjoy a great variety of work and help feed the millions of people in the city who are calling for more and more of the various farm products. It is a question which can be thought on and talked about and still not come to any conclusion; but each boy should give it careful consideration before adopting it or casting it aside.

Preparing for sweet corn crop.

ADDRESS.

L. C. HOLSTON, President Maine Seed Improvement Association.

After a most variable, exasperating and disappointing season, we have again met to discuss ways and means of working in unison with nature to produce sufficient crops to supply our share of sustenance to a world continually calling for a better product.

In trying to obtain larger yields we have too often overlooked the value of a crop of quality. We, as an association, have now to keep in mind the demand of a public more discriminating in its tastes than any that has gone before. We farmers who cater to a retail trade find our customers are calling, not so much for just potatoes as for a potato of fine cooking quality; not for just peas, but for peas that are tender, sweet, and luscious; not for just sweet corn, but for corn that is tender and the acme of sweetness.

Now what demands the public make of the retail farmer will soon be made of the farmer who sells in a wholesale way.

To the writer, having been in touch with this Seed Improvement Association since its inception, great studies have been made in seed selection, as to yield, freedom from disease, and trueness to type. Those of you who remember the first exhibits will remember especially the variation shown in a single example of what was then thought to be good seed stock. Look at the change today. Our business is still growing and the problem of obtaining and training inspectors will soon be one not easily solved.

Up to the present, only the call of the seedsmen and producers has been heard; but soon, not only we, but they, will have to listen to the incessant cry of the ultimate consumer.

Quantity has been the goal sought, but quality is bound to be the one attained. Let us hope they may both go together, but nature seldom works that way. So do not let us forget this general rule, but keep in mind always the demand of the consuming public, and that he is coming to care less and less for the cost or nutritive value of an article so long as it pleases the eye and sense of taste.

I recommend that this subject be taken up at this meeting for discussion.

A crop that seems to need a great deal of care and attention is sweet corn. It means a good deal to the State of Maine, for no other soil conditions seem to produce such corn.

Our state is the garden spot of the world for the production of sweet corn and, as such, should not we see to it that we do not lose an income that is rightly ours if we take proper precaution to keep it within our grasp. I think it is conceded, by practically all growers of this product, that the chances of obtaining a fair yield is becoming a greater gamble every year. This is due in a great part to the fact that a very small percentage of our seed is raised in the state or in latitudes as far north as ours. Nearly all of our seed comes from southern points where the seasons are much different than ours. Should not we raise our own seed? Is it right that we should waste our time and the fertility of our soil in trying to raise a crop from unacclimated seed? Probably we will never know by many thousand dollars the amount that has been lost this year, due largely to this cause. Someone will say that the greatest loss in crops any year is largely due to poor or improper seed, but for the amount of seed planted there is not the slightest doubt but that the sweet corn yield is, or possibly has become, the most conspicuous example of what is likely to happen when our seed is raised where the seasons are longer and warmer.

The last few years have given us warnings. Shall we heed them? In order to protect the sweet corn industry some way must be devised for making it an object for all farmers in every section where sweet corn is raised to devote their energy to the production of seed.

This work is being carried on to some extent by the extension work of the University and has proven a success in so far as they have practiced planting locally grown seed.

Is it not time that we appoint a committee to wait upon the Canners' Association, to ascertain views on this subject and the best methods of handling a crop so eventually a crop of Maine?

RESOLUTIONS PASSED BY MAINE SEED IMPROVEMENT ASSOCIATION.

Resolved, That this association adopt, as a permanent feature of its annual meeting, a sales table where members of the association may display and offer for sale certified seed; and further, that the executive committee employ an attendant to look after and take orders for such seed.

Whereas, seed of questionable merit has been exhibited at our annual meetings, be it

Resolved, That the judges be given authority to withhold, at their discretion, any or all premiums from such exhibits.

Resolved, That a committee of three be appointed to confer with the Maine Canners' Association, with the object of securing the use of locally grown sweet corn seed.

Resolved, That the joint meetings of the Maine Live Stock Breeders' Association, the Maine Dairymen's Association and the Maine Seed Improvement Association have been a success and are of much benefit in advancing the interests of these associations.

Resolved, That the Maine Seed Improvement Association endorse the county demonstration work as carried on under the direction of the College of Agriculture and we would strongly urge the desirability of extending this work as much as possible.

Resolved, That this association endorses the work of the Girls' Agricultural and Canning Clubs and heartily congratulates them on the excellent exhibit they have made at this meeting.

Resolved, That we especially congratulate the farmers on the splendid exhibits of seed and dairy products they have made this year. We believe that these exhibits constitute one of the most important features at our meetings and that every effort should be made to increase them.

Resolved, That the association appreciates the efforts of the Lewiston Board of Trade, the citizens of Lewiston, the press, the railroads, the exhibitors and all others who have assisted in making this meeting a success.

R. L. COPELAND,
M. D. JONES,
F. M. SURFACE,
Committee.

POTATO GROWING AND POTATO DISEASES FROM MAINE TO CALIFORNIA.

W. J. Morse.

With the rapid development of transportation facilities, both at home and abroad, entirely new and often dangerous disease problems have arisen to confront the potato grower. Some of these potato troubles a generation ago, or even a decade or two ago, we knew but vaguely, or only by reputation. Some we had never even heard of in this country. Yes, more than that, what is undoubtedly the most dangerous and destructive potato disease yet discovered, was unknown till 1896 when it was first reported from Hungary. This is the wart disease or potato canker. In 13 years it had crossed the Atlantic Ocean and was present in Newfoundland. In the meantime it has become widely distributed in England, Ireland, Scotland and Wales, and has been found in Germany as well. So far as known it has never reached the mainland of North America.

Powdery scab, while undoubtedly first observed about 75 years ago, has only recently come into prominence. Now it is widely scattered, particularly in the British Empire. England apparently has been very generous in passing the disease along to her colonies, but recently some of them, more especially Canada, have taken matters into their own hands, and quarantined against her. The distribution of powdery scab in Maine points strongly to the conclusion that Canada is the original source of the major part of the powdery scab infection in this state. The same thing is true of the other infected regions of the United States. Following the discovery of the disease in Maine, it was next found in the two most northern counties of New York. Next came the information that it was present in the states of Washington and Oregon and in British Columbia to the north of them. Now within a month comes the information that it is quite widely distributed in the northeastern part of Minnesota along the Canadian line. All this, taken together with the fact that powdery scab is quite widely scattered in Canada, makes a strong case against that country However, before we accuse her of being the entire cause and source of our troubles, one very important fact which we did not know at first, should be taken into consideration. It now looks as though powdery scab is a disease, the distribution of which is quite definitely limited by climatic and soil conditions. It may be, and there is considerable reason for believing this to be a fact, that in America it will only develop in the cooler, moister climate of Canada and along the very northern border of the United States. There is no doubt that thousands of bushels of potatoes infected with the disease have in recent years been used in the South for seed, yet a most careful search has failed to reveal any in the crops they have produced there except a few tubers at or near Hastings, Florida. It has not been found in the southern part of our own state even, except in the extreme southeast where the summers are usually relatively cool and wet. Its absence from the remainder of the state can hardly be claimed to be due entirely to freedom from contagion. It seems almost beyond belief that infected potatoes have not been planted from time to time in that part of Maine which is now thought to be and apparently is free from the disease.

Blackleg is another undesirable emigrant which Europe, especially England, passed along to us by way of Canada. We have evidence also in certain instances of direct importations of blackleg and powdery scab from European countries. Undoubtedly such importations were numerous in the years just previous to the time when the potato quarantine became effective. In the fall of 1913 I found powdery scab abundant in some European shipments of potatoes which arrived in Boston, and the same condition was found by the Government pathologists when they looked into the situation both in Boston and in New York City.

Blackleg was first reported in America in 1906 but it had apparently been recognized in Canada a few years previous to this. Undoubtedly it occurred in Maine some years before it was recognized and described by myself the first year I was here, or in 1907.

Within our own country several important developments in the potato industry have taken place during recent years. Potato growing as a late winter and early summer crop has come to be an industry of considerable magnitude in certain southern states. Under their climatic conditions potatoes rapidly deteriorate and it is necessary to secure new seed each year from the north. Maine leads in furnishing this seed but New York, Michigan, Wisconsin and Minnesota are important factors in the trade and are bidding for it in every way possible. Since Maine potatoes are shipped largely to all the important potato growing sections from Texas north to New Jersey and Long Island, we enter into competition with all of these states at one point or another. In addition other northern states, Vermont for example, where the potato is a less important crop, ship seed south to a certain extent. It will be seen then that any potato disease which gains a foothold in any northern locality stands a much greater chance of being widely distributed throughout the country than ever before.

Dr. W. A. Orton of the United States Department of Agriculture, being familiar with all these conditions in various parts of the country and in Europe and realizing their importance to the future development of the potato industry in America, conceived the idea of inviting Geheimrat, Dr. Otto Appel, the leading authority on potato diseases in Germany, to come to this country and make a survey of the more important northern and western potato growing areas during the summer of 1914. It was my good fortune to be a member of the party which accompanied Dr. Appel on this trip from Maine to California.

In every state we visited we were joined by the plant pathologists, horticulturists, agronomists and county experts or extension representatives of the various agricultural colleges and experiment stations. At each stop we were met by from several to 50 or more practical potato growers who generously provided automobiles for transportation, whereby we were enabled to visit all the potato fields we had time to see while in that vicinity. They often carried us a hundred miles or more along the route of our journey by that means. From Maine to California in about two months we covered some 14,000 miles, 1,200 of which were by automobile. Our itinerary was so planned to make as much of our railroad travel as possible at night or on

Sunday, therefore it will be seen that we spent a good share of the day, six days in the week, during this time in potato fields. Rain interfered with our plans but one day and then we attempted to work for we had crossed the whole state of Minnesota, to the edge of North Dakota to have a single day in this region.

Previous to this trip I thought I had some pretty well defined ideas as to what constitutes a good potato soil. Before I got back I decided that I knew nothing about it. In Michigan the Danish farmers were growing excellent crops of potatoes, with the help of clover and cows, on what was once largely pure sand, and formerly covered with white pine—land so poor that American farmers would not settle on it. In certain parts of central Wisconsin the Germans and Swedes were doing even better with what at first appeared to be a somewhat similar soil. When we reached the famous Red River Valley of northern Minnesota on the rainy day mentioned we found the potato soil was a sticky, black prairie gumbo, so sticky and slippery, in fact, that after the first mile or two with the automobile provided, some of us refused to ride farther and got out and walked the rest of the way in the rain.

In Idaho they are growing potatoes, second to none in the country, without fertilizer on land which, before the water was turned on, would grow nothing but sage brush and jack rabbits. Much of this soil came from disintegrated lava, for underlying this section is solid lava rock at a depth of from 3 to 30 feet. On the so-called tule lands of the deltas of the San Joaquin and Sacramento river valleys in California, Japanese and Chinese are growing thousands of acres of potatoes, also without fertilization, the yields on the best of which running from 350 to 550 bushels per acre.

In describing our trip I shall omit all reference to conditions in our own state which are familiar to you, except to describe certain phases of the potato disease situation which apply to Maine or are related to what I shall discuss farther on.

We have recently come to the conclusion that in Maine we have entirely overlooked in the past one type of disease which sometimes does considerable damage in the southern and central parts of the state but which, apparently, is of less importance in Aroostook county. I refer to the so-called Rhizoctonia disease of the potato. The name comes from the fungus which is said to cause it, but it is sometimes spoken of as the "little potato disease." This, however, as it occurs in Maine, describes only one phase of it.

Everyone who prepares potatoes for the table is familiar with the little black or brown spots which sometimes appear on the tubers and which look like hard, superficial particles of dirt which will not wash off. They are not dirt at all, but compact masses of fungous threads, or the over-wintering stage of a fungus which is as common as pebbles in New England potato soils. Except that when it appears in quantity and thus makes the surface of the tuber more or less unsightly I had always felt that it was of no economic importance in New England. Our recent experiences with this fungus as a cause of disease of potatoes have led us to conclusions quite the contrary.

Soon after the potatoes are planted the fungus begins to grow and, often in central and southern Maine, attacks the young sprouts and kills them before they come up. The stalks, however, may get some distance above ground before being killed. Again, cases have been observed where fully 90 per cent of the plants were attacked sufficiently to produce a practical failure of the crop so far as merchantable tubers were concerned and very little evidence of disease could be seen by looking at the tops. All through the season they appeared to the average observer to be perfectly healthy above ground and gave promise of an abundant harvest, but they suddenly died when dry weather came on in August, when the tubers were about half grown. In such cases it is a very insidious type of disease. The fungus frequently attacks the underground, tuber-bearing stolons, cutting them off after the young potatoes have formed, or before they obtain much size, thus bringing about the production of a large number of small potatoes in a hill; hence the name, "little potato disease."

There are a number of disease conditions, mainly characterized by the appearance of the parts of the plants above ground, some of which are quite distinct while others appear to grade into each other, and which are partly parasitic in nature and partly of unknown origin. In Maine, with one exception, these are by no means as common nor as destructive as they are in the Middle West, Rocky Mountain and Pacific Coast states. However, since those of a parasitic nature, and most of those which so far have been found to be non-parasitic, appear to be carried with the tubers, and tubers from diseased hills usually produce more seriously affected plants than those from which they came, a wise Maine grower will not temporize with them. He will eliminate the diseased plants as soon as they appear in his fields and before they begin to set tubers. If the disease occurs in his fields to such an extent that this practice is impossible, he will dispose of the entire crop and endeavor to secure seed for his next year's planting from fields which showed none of these troubles.

These leaf and stem troubles are known variously as wilt, leaf-roll, curly dwarf, rosette, mosaic, etc. Mosaic is the only one which occurs to any extent in Maine. Of the two leading varieties grown it is almost entirely confined to the Green Mountain, practically none being seen on the Irish Cobbler.

Mosaic is characterized by more or less wrinkled, irregular, distorted foliage of a variegated color. The leaves are variously spotted and mottled with a lighter green, giving a calico effect. No definite parasite has been found associated with it. It certainly indicates a weakness of the seed, and should be eliminated wherever it occurs.

Potato wilt, wherever found, is undoubtedly of a parasitic nature. Apparently a similar type of disease may be caused by two different types of fungi. This is not particularly important to us, but it is important from the standpoint of the practical grower to know that potato wilt is carried by the seed tubers and that once in the soil the fungus which causes the disease may persist there for an undetermined time. So far we have seen very little of it in Maine and it is much less prevalent here than in any other of the leading potato growing states visited.

While wilt may appear earlier it does not usually show up in a striking manner till about blossoming time or later. In the earlier stages the affected plants may be lighter green, and later even take on a yellowish appearance. The lower leaves begin to die first, and thus it is often overlooked by the average observer. His attention is usually attracted by the premature death of the plants, following a wilting or withering of the upper leaves.

If the stems of potatoes affected in this manner are cut off close to the surface of the ground, either above or below, but more especially the underground portions, it will be seen that they show a ring of discolored or browned tissue a little way below the surface. This is in the region of the water conducting system and undoubtedly the wilting and death of the plant is due to the clogging of the conducting vessels, thus shutting off its water supply.

The fungus also attacks the roots and tubers. In my experience such tubers as have already formed at the time of the examination of plainly diseased plants usually show some signs of infection at the stem end. This may be indeed slight, just at the junction of the stem and tuber, or it may appear in the form of a distinct brownish ring a little below the surface of the potato, and extending some distance from the stem end. The small amount of wilt observed in Maine, while the general effects are similar, appears to be of a slightly different type than that described, in that the growth of the fungus, and the resulting browning of the stem may extend up for considerable distances, often into the leaf stalks. The wilting characteristics are more pronounced, for the plants will often suddenly wilt and die without much previous signs of disease. Regardless of the cause, potatoes from plants so affected should never be used for seed purposes.

We frequently find in Maine a potato trouble where the diseased tubers might be mistaken for those affected with the wilt fungus. Here the tissues, usually confined to that portion outside the vascular ring, show a peculiar mottled browning, or irregular netted appearance. This has been given the name of net-necrosis. There is no evidence that it is of a parasitic nature, but it may indicate a constitutional weakness, therefore tubers so affected should not be used for seed. Even the browning of the vascular ring, in our experience, does not always indicate the presence of a parasite that we can discover, but all these things do indicate a weakness of the tuber.*

Potato leaf-roll, a disease which has been receiving considerable attention in Germany during the past few years, has only

*Experimental work conducted after this article was written, but before publication, has shown conclusively that planting tubers affected with net-necrosis results in a material reduction in yield.

recently been recognized in this country. It may have been present for a much longer time before the characters which differentiate it from similar troubles were recognized and pointed out. In view of the experience of European growers with this malady, and in view of the fact that Doctor Appel says that what they call leaf-roll in Germany is identical with a trouble which is associated with and apparently has become an important factor in reducing the yields in certain central and western states, notably in some of the irrigated sections of Colorado and Utah, it is important that Maine potato growers become familiar with the characteristics of the disease and be on their guard against it.

After seeing field after field having plants affected in this manner and seeing them in the presence of Doctor Appel, who is probably the best authority on this subject, I am thoroughly convinced that there is such a thing as leaf-roll. I am also just as thoroughly convinced that there are at least one or two other types of foliage troubles which simulate this and grade into it in appearance, and which at times it is impossible for even the most expert to differentiate by simply looking at the tops alone. This, however, has little real significance to the practical man. He should look upon *any* abnormal type of potato plant as something which should not be tolerated in his field, and should not use for seed purposes tubers produced by such plants.

In this connection and at this point I wish to introduce for the sake of emphasis, a general observation with regard to tuber-borne potato diseases, and this includes nearly all the more important potato troubles. The practical potato grower does not need to be a trained pathologist in order to avoid these difficulties. It is not even necessary for him to be able to distinguish all of these various diseases, although it is often an advantage to be able to do so. It does not take a very keen observer to tell an abnormal or diseased potato plant or tuber from a perfect one. If only sound, healthy and perfect potatoes, grown from healthy plants, are used for seed and then disinfected by one of the regular recognized means before planting, many of our potato troubles would vanish. For example, powdery scab could have been kept out of Maine in this way without the potato growers knowing the difference between it and common scab. Yes, without knowing that such a thing as powdery scab existed.

Potato leaf-roll, as its name implies, is characterized by a conspicuous upward rolling or curling of the leaflets on their mid-ribs. The leaves assume a more upright position than is normal. A striking characteristic of the disease is the change in the color of the leaves. This is a yellowing, frequently associated with a reddening or purpling. I was by no means always satisfied that much of what was pronounced to be leaf-roll, even by the experts of the party, always occurred entirely independent of other disease producing factors. After a certain amount of familiarity with the disease was acquired, two important characteristics were observed, which, if present, tended to eliminate any doubt which existed. One of these was the appearance of the reddish and purplish colors in the curled leaves, and the other was the almost entire failure of the affected plants to set tubers. I know of no other potato disease where these characters are of constant occurrence together.

Plants affected with leaf-roll are more or less stunted in appearance. They appear much longer lived than those attacked by wilt, and may live as long as the healthy plants in the same field. Apparently it is a non-parasitic trouble, though in some cases it has been maintained that it is caused by fungi. Leaf-roll is carried by the seed tubers, hence those produced by diseased plants should not be used for seed purposes.

Although fields have been reported in Maine as carrying as high as 100 per cent of the disease, I personally have seen almost none of what I should call true leaf-roll in this state. I have, however, seen a trouble of similar appearance associated with Rhizoctonia injury which might easily be mistaken for it.

Plants affected with what is known as curly dwarf have every appearance that the name implies. The whole plant is dwarfed and more compact than normal and has a peculiar crinkled foliage. An important characteristic of the disease is that the stems and leaf petioles are distinctly brittle as compared with those of normal plants. As compared with leaf-roll the leaves curl downward rather than upward. Occasionally a plant showing this trouble is seen in Maine, often associated with the mosaic disease. The cause of curly dwarf is also unknown.

I have now described the more important potato diseases which we met in our trip across the continent and have stated something as to their occurrence in Maine. I now wish to make a brief comparison with disease conditions farther west and to tell you something about potato growing in the states visited.

While we spent a part of one day in western Vermont, our real potato disease studies after leaving Maine began in New York. Entering the state at Plattsburg on Lake Champlain we proceeded westward through Clinton and Franklin counties to Malone and from there to Rochester. From Rochester we first worked eastward to Geneva and then westward to Buffalo.

In northern New York, with few exceptions, the fields were not equal to the average in Aroostook. There was much less blackleg, but Rhizoctonia, wilt, leaf-roll and similar diseases were much in evidence. The mosaic disease, as in Maine, was particularly common on the Green Mountains. It is interesting to note that we did not see this disease again on this trip, but I have recently been told that this year it appeared over much of the territory covered.

In northern New York very little commercial fertilizer is used in comparison with Maine, particularly Aroostook. Some cases were found where from 400 to 700 pounds per acre were applied, but usually it was from 200 to 300 pounds. In some towns around Plattsburg they were using stable manure shipped from Montreal, costing $12 for a carload of 43 tons with 75 cents a ton for freight added. To one accustomed to the close planting practiced in northern Maine there seemed to be a big waste of land here, for it is common to plant three feet apart in checks. In some sections visited on the trip, I believe in Michigan, the hills in a few fields were 40 x 40 inches.

In western New York, in Ontario, Livingston and Munroe counties, we saw a district of considerable importance as a seed growing area. At that time this was not at its best on account of having experienced a long drouth. This made the effects of Rhizoctonia and wilt very prominent.

Members of the party visited some of the important potato growing centers in both the upper and lower peninsula of Michigan. Near Port Huron in St. Clair county, where the soil is a sandy loam, some leaf-roll, wilt and Rhizoctonia injury were observed. The last two mentioned were particularly bad on a few fields.

The colony of Danish potato growers already mentioned is located not far from Grand Rapids. They have a light, sandy soil, formerly heavily wooded with white pine. The lumbermen left it a barren waste of stumps and drifting sand, with little or no vegetation. In fact, the stumps of many of the pines are still there, but they are now utilized by their present owners for fencing. You can go for miles and miles in this section and see no other fences than those made of pine stumps tipped over on the side with roots attached. The results which these Danes have accomplished since they came there 20 or 30 years ago are little short of marvelous, and this has all been brought about by a system of farm management which includes the growing of livestock, clover and potatoes. General farming is practiced but dairying appears to be the leading industry. Clover and potatoes are the chief crops, nearly every farmer growing from five to ten acres of the latter. Some diseases were found here but these were not serious.

The potato industry is being developed in the northern peninsula of Michigan in the vicinity of Houghton. This locality appears to be especially adapted to the raising of seed, and as yet it is quite free from disease.

Wisconsin, already a leading potato state, has wonderful possibilities ahead in the line of development. Wisconsin, like Maine, has really not yet begun to raise potatoes and has a much greater unused area to the northward, adapted to this purpose, than Maine. The potato soils of northern Wisconsin are not, according to my observations and from what I can learn, equal to those of northern Maine. The most of our observations in Wisconsin on this trip were made in Waupaca, Portage and Chippewa counties in the central and somewhat north of the central part of the state.

The soils in these sections are somewhat sandy, but not so much so as in Michigan. They are underlaid by a clay subsoil 10 or 15 inches down, making them of much greater water holding capacity than one would first suspect. They have one advantage over Aroostook county in that corn can be grown there, thus making dairying a profitable adjunct to potato raising as well as increasing the range of revenue producing crops.

Apparently stable manure is the chief source of fertilization, although some commercial fertilizer is used in amounts varying from 150 to 400 pounds per acre. They plant rather late, sometimes as late as the middle or last of June. The reported yields run from 150 to 200 bushels per acre. Undoubtedly by adopting Maine methods this could be increased largely. While there are some exceptions, potatoes are planted in checks 3 x 3 feet and practically level culture is followed. Though some wilt, leaf-roll and Rhizoctonia injury were observed, the Wisconsin potatoes as far as seen were very healthy.

Our observations in Minnesota were confined to the region around Minneapolis and St. Paul and that section of the Red River Valley near Morehead, or across the river from Fargo, North Dakota. It would be unfair to make sweeping statements based on such limited observations but, so far as I saw them, conditions here were not up to my expectations.

Large amounts of wilt and Rhizoctonia injury were observed around St. Paul, and practically all the plants on certain of the fields were characterized by Dr. Appel as having leaf-roll or the beginning stages of it. In the single day spent at Morehead, rain largely interfered with the inspection work, but so far as could be seen wilt, and Rhizoctonia injury, particularly the former, were very common.

Several days were spent in Colorado, which was the next state visited. Most of the potatoes that we saw in Colorado, Utah and Idaho are raised under irrigation and the soil is naturally fertile. As a rule the altitude is such as to produce a relatively cool climate and the almost continuous sunlight experienced during the growing season is favorable to starch formation and growth. Drouth need not be feared, and the equally disastrous results of excessive rainfall, followed by late blight and rot, which is the case with us in Maine, are also eliminated.

On general principles one would say that conditions for potato growing are ideal, but in Colorado we have one of the most striking instances of disease development leading to practical failure of the crop, even under these apparently favorable conditions. The same thing is beginning to show up in certain parts of Utah.

What is known as the Greeley district, not far from Denver, has been one of the most important potato growing districts of Colorado. This district, which at one time was one of the most noted in the United States, is only about 20 miles long and 12 to 15 miles broad at the point of greatest width. Potato growing began here about 1870 and was uniformly successful up to a little less than a dozen years ago when the whole industry began to go to pieces. One potato grower told me that in 1904 they shipped 14,000 cars within a radius of 15 miles of Greeley. This dropped to 8,000 cars in 1910, and in 1911 only 200 cars were shipped. Others set this last figure at 600 cars. In a few seasons potato growing changed from an important industry to one of little account. Conditions were a little better last year, but were still bad enough then. A recent report from there indicates that the crop of the present season makes them more hopeful.

The strangest part of this slump in the industry at Greeley is that no two people appear to agree as to the cause of the trouble, and they have some very keen, up-to-date men among the potato growers there. There is certainly evidence enough of disease to account for many of the difficulties experienced, for leaf-roll, wilt and Rhizoctonia were almost universally present in a marked degree in the summer of 1914.

Large crops of alfalfa are produced, and potatoes are grown on alfalfa sod. This, of course, tends to increase the nitrogen content of the soil, which latter is claimed by some to be deficient in phosphorus. There is a strong probability that some of the trouble may be due to an unbalanced condition of the food materials in the soil, but I could learn of no attempt being made to discover this, or to use any form of commercial fertilizer to correct it if it does exist. Sugar beets are also grown to a considerable extent, and some growers maintain that the trouble with potatoes began coincidentally with the introduction of sugar beets. What the connection is between the two, if any, they are unable to state.

At Carbondale, Colorado, on the other side of the Continental Divide, and not far from Leadville, conditions are quite different from those at Greeley. It is true that the industry here is more limited and is of more recent development. In the case of one large concern, at least, I do not believe that they will ever have to go through the Greeley experience. It is owned and personally managed by two business men, and I have yet to see a case anywhere in the United States where men engaged in a line of applied agriculture have made such a thorough study of all phases of their business. They have made use of every scrap of scientific and practical information they can obtain, so far as it was applicable to their conditions. These men are farming to make money and not to spend it. When I state that they spent $60,000 for their water supply alone it will be seen that they are engaged in no small undertaking. They have between 2,000 and 3,000 acres of land and something over 1,000 of this is under cultivation. I was told that not an acre of this is for sale.

I never saw finer looking potatoes than theirs. By careful selection they have largely eliminated disease, undesirable, irregular types of tubers and low yielding strains, so that their average yields are something remarkable. In selection their aim has not been to increase their yields by growing big tubers, but to propagate only those strains which give a maximum number of tubers per hill of uniform table size. While they set apart each season certain land planted with carefully selected tubers in which to raise their own seed for the coming year they are not in the seed business. Practically all their crop goes as table stock. Being business men you would expect them to look for a special market where good prices may be had and they have. Most of their potatoes go to high class hotels and city clubs. In fact, they supply one of the leading clubs in New York City.

It is interesting to note that in this part of Colorado we saw the first cases of blackleg after leaving northern New York, although it is known to occur in most of the sections visited.

Certain parts of Utah are having experiences similar to those mentioned for the Greeley district of Colorado. We saw considerable of the territory around Salt Lake City and from there north through Ogden, Brigham and Logan to the Idaho line. As a rule, the potatoes seemed to be in a rather unsatisfactory condition. An interesting development in the west is that it is by no means uncommon for private concerns to establish laboratories and employ pathologists of their own. The American Smelting and Refining Company has done this at Salt Lake City. One of the objects of this laboratory is to find out the cause of recent, local potato failures, and devise remedies.

Very few easterners think of Idaho as a potato growing state, but the irrigated lands which are now being opened up or have been opened up in Idaho during the last ten or twelve years are, so far, nothing short of a potato grower's paradise. Probably nowhere else in the country can so large yields of first-class potatoes be obtained at so little expense. In average yields per acre Idaho is rapidly coming to the front, and unless some disaster like that which occurred in the Greeley district of Colorado overtakes them it would not be surprising if they took the lead in the country in yields per acre before many years.

This all agrees with what the land agent and promoter tells you. There is, however, one more thing which he forgets to tell you. While southern Idaho can and does produce cheaply some of the largest crops of most excellent potatoes, the people to eat them are located hundreds of miles away. Either way you go you must haul the crop long distances over high mountain ranges, and much of the profit goes to the railroads. It will be a long time before the industry in a large way will become very profitable here, unless some method is devised to utilize the crop locally in such a manner that it will net a fair price. At present they do not have starch factories or other industries to take care of the culls and excess crop.

While blackleg, wilt, leaf-roll and the Rhizoctonia disease were all found, nearly a week's study of the situation in southern Idaho indicated that, so far, these diseases have been of very little importance there.

One farm visited at Twin Falls, Idaho, was of particular interest to me, since I found the blackleg disease there. A few years ago I was called to visit a potato field in Piscataquis county where blackleg was common. This was on a farm where the disease had never appeared before. The field was planted with seed grown on the Twin Falls, Idaho, farm. The Idaho grower got it from a man in Carbondale, Colorado, who imported the original seed from Scotland. Undoubtedly the disease came all the way from Scotland to Maine with the seed tubers by this round-about way, and all within five years. It is a very good illustration of how some importations of infected seed may result in a wide distribution of a tuber-borne potato disease in a very short time.

Visits were made to northern Idaho, and various parts of Oregon and Washington. Although more or less seed is grown, particularly in the latter state for California planting, no especially large potato districts were visited.

With one exception, no particularly interesting development of potato diseases was observed, sufficient to require special mention. Near Tacoma, Washington, at a substation of the Washington Agricultural Experiment Station, was found what is apparently an undescribed leaf trouble. This had already been observed in 1913 and 1914 on some potatoes that the United States Department of Agriculture brought to Maine for some of their breeding work. I have also found a few affected plants in Maine fields this season. It is characterized by a peculiar browning or streaking of the under sides of the leaves or leaf petioles along the line of the veins or midrib. It has been called, for the want of a better name, the "streak disease." It has the appearance of a bacterial trouble, but, as yet, no bacteria have been isolated from the diseased plants which are capable of causing the disease upon inoculation.

Regarding California, the last state to be taken up, I will confine what I have to say to telling you something about the potato industry of the deltas of the San Joaquin and Sacramento rivers, near Stockton, the county-seat of San Joaquin county. This area, sometimes spoken of as the "tule lands," consists of some 250,000 acres of very fertile peat soil.

The lands lie mostly at or near sea level and are made up of the more or less decomposed roots and decayed remains of the tule or giant bulrush and other marsh plants to which has been added the sediment deposited by the river. The marshes are reclaimed by throwing up levees by means of great dredges along the banks of rivers and sloughs to exclude the tidal and flood waters. During the growing season the water is kept at the required level by means of ditches and pumps. Additional water needed for irrigation during the summer months is brought over the levees by siphons or through by means of head gates. Various crops are grown, but potatoes, of which there are annually planted some 40,000 or 50,000 acres, is the principal one.

These lands, like many others in California, are divided into large holdings, frequently dating back to the original Spanish grants. As a rule, they are not farmed by their owners, but are rented mostly to Japanese growers, and the work is done largely by Japanese and Chinese laborers, who live in camps in the fields. The largest potato grower in the United States is one of these Japs, who has planted as high as 6,000 or 7,000 acres a year. Land rental is high, often amounting to $30 or $40 per acre per year. Consequently the grower has absolutely no interest in the land itself, except to get all he can out of it as long as it pays him. Then he moves on to fresh land which is constantly being reclaimed.

For the first three years after reclamation the lands are cropped with potatoes every year. Then it is barley alternating with potatoes until great reductions in the yields of the latter crop make it no longer profitable. If this system is persisted in, yields which, in the beginning, run from 350 to 550 bushels per acre, drop to as low as 60 bushels per acre. As far as I could learn absolutely no fertilizer is applied and the diseased or cull potatoes are left on the ground as a source of infection to future crops.

The effects of leaving culls on the ground are even worse than they would be in a more rigorous climate. On account of the mild winters on the deltas the cull potatoes produce a large volunteer crop in the barley so there is a continuous growth of potatoes on the land from year to year. Thus diseases, once introduced, have abundant opportunity to live over and increase. The tenants move from camp to camp from year to year and carry their seed with them. In fact, no better method could be devised to propagate and spread potato diseases in this region.

As might be expected, wilt and Rhizoctonia are rampant. A Government expert on the ground estimated that the losses from the latter amounted to at least a million dollars in the delta region in 1913. In the mild climate of California a secondary trouble follows the wilt and materially adds to the losses from this cause. This is known as the "jelley end" rot and is caused by other fungi and bacteria which gain entrance through the lesions produced by the wilt fungus.

In addition, they have two interesting animal pests, the tuber moth and the nematode or eel worm. The former makes large tunnels or channels in the flesh of the tuber, while the latter attacks the surface, giving it an uneven, knotty appearance. Apparently the tuber moth is not so likely to attack the potatoes in the moist soils of the deltas, before they are dug, as in the dryer situations. One case was reported where only one or two per cent of the crop was attacked when dug, but several days after, 90 per cent of the culls left on the same field were attacked by the tuber moth.

California makes much of her quarantine and protective legislation with respect to outside states, but a student of the potato industry can find, probably, nowhere else in the United States a more striking case of neglect and utter disregard for the conservation of natural resources than that of the fertile delta lands of the Sacramento and San Joaquin rivers.

CORN BREEDING.

PROF. FRANKLIN MENGES, York, Pa.

(Stenographic Report.)

I am delighted to be here in Maine for the first time. I have known about Maine people for a good long while, especially about my friend, Mr. Rogers, and if you are all as good fellows as he, I shall like you.

I have heard about you in other ways. We import large quantities of seed potatoes from Maine. I do not know that we have ever imported any from Michigan, Colorado or California, or from any other states except Maine and New York. I want to say to you, my friends, that, if you are doing as well along other lines as you are along the line of developing the potatoes, you are doing mighty well.

I am to talk to you about a crop of which I believe we can raise larger quantities than you—I may be mistaken but I believe it. We are satisfied that in our section we can produce a larger yield of corn to the acre than can be produced in any other section of the United States. I am covering considerable territory when I say that. If a farmer is anything, he is a good producer. That is his business; or he is growing plants, a better definition of a farmer's business. I think he ought to produce as large a quantity of human nutrition as is possible in his soil and climatic conditions. It costs just as much to produce a small quantity as it does to produce a large quantity of these products.

You and I know, and I believe this is an association composed very largely of dairymen, I may be mistaken because I do not know any of you, that we have produced or made a better cow by breeding. You know that the Holstein cow is in all probability the oldest dairy cow we have. We started some 2,000 years ago to develop the Holstein cow. Today we have a cow that makes about 29,000 pounds of milk and about 12,000 pounds of butter, and she is a Holstein. How did we get her? We got that cow by breeding.

A breeder chose a cow that would produce a larger amount of milk than any other cow, and if he had a bull whose offspring was producing more milk than any others, he bred those two together, and he went higher and higher, until we got what we have today. The Jersey and the Guernsey cows came from the Jersey and Guernsey Islands in the English Channel. For 500 years those people had a law prohibiting the importation of any other animals but the Jersey and the Guernsey, and they bred along these lines for a long time, until today we have Jersey cows which give about 20,000 pounds of milk and over 1,100 pounds of butter a year. We got them by breeding.

Now take the horseman who breeds draft horses, and what kind of a horse does he want? He wants a horse with short joints and tremendous pulling strength, and he breeds horses along that line. The race horseman wants the long jointed horse, who can throw himself a tremendous distance and do it quickly, and he breeds along that line, until we have today a horse that can do a mile in two minutes. They have done this by breeding.

I understand that you people have been working along the line of breeding potatoes. The same process of development applies to corn. I am a practical farmer, and I breed corn, and I am not going to use any scientific terms this morning in discussing this question. I am going to use plain words in telling my experience. Some fellows have a way of getting up in meeting and telling their experience, even if it is not always so. An experience meeting is all right once in a while.

What is a dairy cow? Why we have made her a milk factory by breeding. And what is a cornstalk? A cornstalk is a corn factory. We want it to produce the largest possible amount of corn that can be grown under our soil and climatic conditions and under our management. It is very important that point be considered. In order to do this, we must take our observations in the cornfield; no better place in the world to study corn. Go out and study it there, and see what Nature can actually do under your conditions. We study that cornstalk in the cornfield. We want the stalk that will produce and ripen, within our season, the largest amount of corn. This is the problem we wish to solve. How long a season have you?

Answer. One man says, "100 days," another, "90 days is better."

In certain sections of Pennsylvania, we do not have more than 100 or even 90 days of corn growing weather.

Member. We had only about ten days this past season.

If you had only ten days, did you import the corn you have out there?

Answer. It grew in spite of the weather.

If you can grow stuff in spite of the weather, you are just the fellows we want. We will take that 90-day proposition. Out of the 90 days the probabilities are you will have only about 50 or 60 days when there is much corn made. You know it takes heat to make corn, because corn is nothing more or less than stored up sunlight, and you must have sunlight and heat in order to make corn. We should study the cornstalk from the standpoint of the fact that it has the capacity to store up the largest amount, in all probability, of human food, of any plant we raise. It may be you can grow more potatoes for human food, but it is true about the corn with us. In York county, Pennsylvania, we have a Boys' Corn Growing Club, and we try to instruct our boys to go into the fields and select the cornstalk that will grow the largest amount of corn, within the limits of our season, and ripen it. I have not seen it up here in Maine, so I must tell you what kind of a cornstalk we want. It is about ten feet tall. We have cornstalks down in Pennsylvania which are 18 feet tall, but we do not want the boys to select a cornstalk of that size, because there is too much energy of the sun stored up in the development of the stalk. We do not raise corn for the stalk, but we raise corn for corn, and the stalk that will produce the largest amount of shelled corn, is what we are trying to produce. I suppose you people who are developing potatoes are working along the same line. We want a ten-foot stalk, and we want that stalk to have, first, a splendid root system. When we try to select a seed stalk, we try to pull it up. If it comes up easily, we do not want it, because it has not a strong root system. We want that stalk to be 1 1-4 or 1 1-2 inches in diameter, at the base, of a dark green color, and the foliage about six inches apart on an average, and we want these leaves to be broad, long and corrugated, because they expose a larger surface to the action of sunlight by those corrugations.

Another thing, we want those leaves unrusted—none of those fungous diseases that my friend who preceded me talked about. We do not want anything like that, because those leaves that are punctured and full of rust holes cannot make corn, the leaf makes the corn. I have taken ears that were splendidly developed from stalks with rusted leaves full of holes, planted the seed, and found that they did not produce strong plants, and some did not produce plants at all. They had a weakness I had not thought of at the time. We want the strong, well developed tassel, which is full of pollen, that fertilizes, through the silk, the carpel which produces strong grains.

We have the Leaming types of the Yellow Dent varieties, and the Southeastern Pennsylvania type of corn, and we also have a Whitecap Dent. We sometimes raise Eureka for silos. We raise, mainly, Whitecap Dent for silage, because we want a lot of corn in our silage. What size ear can we raise? We have found that we can produce, with the stalk system that I have talked about, an ear anywhere from ten to twelve inches long, with anywhere from 18 to 24 rows of grains around it, the kernels five-eighths inch long, and we can ripen that grain within the limits of our season. That sounds big; I wish I had brought an ear with me. I will send one to Mr. Rogers. We have not had easy sledding in getting that ear, because there is a tendency that we have to fight. That ear, if we are not watchful, will produce a thick cob, increase the rows of grain, and shorten the kernel, and the weight will be reduced. In other words, we will grow corncobs instead of corn, and we do not want to do that kind of thing.

I have worked along this line for a number of years. I go into the cornfield, find a splendid stalk with all the characteristics that are desirable, and I mark it for seed. Frequently I find, after I get it separated from the rest, that it has short grains and a thick cob. I use only ears which have maintained the length of grains and the number of rows of grains around the ear. I worked along this line for about ten years, and have found out a few things that today I know are not so. Perhaps if I come again I shall tell you I lied to you today, but I am honest about it, if there is such a thing as a liar being honest. The general idea among farmers is to select their seed corn from the best part of the field. Now, do you know that is not right? It is all right when you want to sell it, but not for your own seed. Why not? Here is a reason. I have taken the same type of stalk grown on a part of the field where the soil is poor, and the same kind of a stalk grown on a part of the field where the soil is richer. Do you know that the stalk which produced a large ear under adverse conditions has a stronger character than the stalk which produced a large ear under favorable conditions. The man who is good in bad company is the right kind of a fellow. That is why I select stalks of corn which have produced ears of good corn under adverse conditions; I do not select it from the poorest, because the conditions might be too adverse. When I plant that kind of corn in good soil, I always get better yields and a more highly developed kind of corn, so far as feeding value is concerned. I believe what is true in Southeastern Pennsylvania is also true in Maine.

We have a Boys' Corn Growing Club in York county, Pennsylvania. This fall we had a meeting and had the boys of the club make reports on how much shelled corn per acre they raised, and the boy who raised the largest amount had 133 bushels. I had the honor, not long ago, to go to Chester county, Pennsylvania, and to present to Frank Rimel the award that was given him by the International Corn Growers' Association at San Francisco. There are two boys in the State of Mississippi—and I have the documents with me to show you—who are represented at that Corn Growers' Convention at the Panama-Pacific Exposition at San Francisco who raised 239 bushels of shelled corn to the acre in one year. Whether they raised two crops—they can do it down there—two crops in one year—I do not know. We have done something along these lines in Southeastern Pennsylvania; we have developed the ear that I am talking about, and the boys who are working under these instructions in our corn growers' club have worked along this line.

One time I spoke to an audience of Pennsylvania Dutch, in Lancaster county, the same tribe to which I belong, and I handled an ear of corn I had raised, which I said would shell twenty ounces of corn, and a young farmer sitting up pretty close front, said, "I think I can beat you," and I said, "Bring your ear." In the afternoon he came and we each had an ear and we shelled them. Mine shelled twenty ounces, and his shelled twenty-four; since then I have not carried any ears with me.

About planting this corn, we plant ours in rows three and one-half feet apart, and three feet apart in the row, with two stalks to the hill, as nearly as we can. It looks to me, coming through the country, that you plant a little too thick. When you plant corn at the rate I have stated you have about 8,290 stalks to the acre. Now, suppose that each of those stalks of the Lancaster county farmer had produced an ear which shelled 24 ounces of corn. How much shelled corn would that fellow have had to the acre? About 222 bushels. We have tried hard to eliminate the barren stalk, and have done something. We have a farmer who, on a field of 20 acres, averaged 110 bushels of shelled corn to the acre. That man has worked along exactly the same lines I have indicated.

Regarding the different shape of the kernels. If the stalk has strong foliage and color, broad leaves and strong roots, you usually get corn with good kernels. Over in Pennsylvania, in Potter county, I came across a man who has been developing the flint varieties of corn which would invariably produce two ears to the stalk, ten or eleven inches long. That fellow, by his development, raised a larger quantity of shelled corn to the acre than we average in Southern Pennsylvania. I believe you can develop such a type of corn, which will ripen within the limits of your season. I am not acquainted with your conditions, but I believe it can be done, by the young fellows. I have not much hope of the old fellows, but I have a lot of hope for the boys who are going to be the men who will produce the stuff by and by, if they have the right kind of training.

DISCUSSION.

DR. G. M. TWITCHELL.

I want to say in beginning that I am in a humble frame of mind. I do not know as much as I used to, and I wonder if anyone else here does.

In years past I have been trying to solve a little problem on a little piece of land; I find continually such obstacles to be met, such opportunities opening, that I must say I have not the confidence in myself that I once had. I have enjoyed the address of the Professor. I regret that I have not been able to attend the meetings before, because of duties elsewhere which could not be avoided. I think he touched problems which we need to take home and think about. We have our own peculiar conditions. We have only one or two who grow Dent corn. We grow the flint variety. In the selection of stalks I think we may well heed the advice of the Professor.

Some questions confront us which I think we want to consider well in the study of this problem. The average of the State of Pennsylvania is placed at about 40 to 42 bushels. In Maine, about the same; in Vermont this year, it was about 44. A number of men have been doing better than 100 bushels of 8-row flint corn, so that the whole question of large production is not wholly dependent upon a 20-row ear, but it calls for the study of the yield of the ear, rather than of some other points. It is not an identical thing with growing 90 to 100 bushels of corn. I have yet to talk with anyone in Maine, who claims superior methods. One man said he did only fair and honest work, and took care of his crop throughout the season. Our way of planting in this state as a rule is 36 inches and rows three feet apart. Only one man in New England planting that way said he got a stalk from every kernel planted, and to general knowledge it was from every six. That man has been nominated for the Ananias club. If we should get such seed we should have from 18,000 to 20,000 stalks, and I have yet to find 12,000 to the acre. The average is not far from 85 to 90. If we can only get an 8-inch ear on every stalk, we have a yield of fairly good proportion, but we are seeking for more than that.

The Professor speaks of corn weighing 22 to 24 ounces to the ear. Who has tried the weight of flint corn? A 10-inch ear should give you 8 ounces; 12-inch ear, 10 ounces. A 6-inch ear will have from 320 to 328 kernels; 8-inch ear, 416 to 460; 10-inch ear, 464 to 480; 12-inch ear, 512 to 540.

We must have corn that will ripen in 100 days. In the years I have been experimenting with corn, we have been unable to get 100 days. I want corn beginning to show glazing at 90 days, and begin to cut it at 100 days. On this basis I consider it one of the safest crops in the State of Maine.

I am not in favor of an ear which is so prominent. I want it symmetrical, I want the length, and I want a wide, bright kernel, broad at the top, space on the top completely filled. I do not like those with tapering kernels. The maximum amount of corn on the ear is what we must be seeking, and to get it we must have it well filled, with close fitting rows. The location of the ear on the stalk has much to do with the time of ripening. If an ear comes out 18 inches from the ground and is for seed it will very soon give you a variety which needs less time for maturity. If you select one three feet from the ground, you are getting corn that will not ripen before frost comes. When we select one one and one-half feet from the ground, and another three feet from the ground, you are injecting into the problems of the coming years a problem of unequal ripening of the stalk.

I like to have the stalk taper, with abundance of corrugated leaves, and an ear that sits close to the stalk, about two feet from the ground. I mean to select my seed when the corn is about eight inches high. When I find a nice, vigorous stalk, I stake it and follow it through the season. When the husks have dried one-third back from the tip, I break it; I do not wait until it is fully matured. J. J. H. Gregory, years ago, was at some of our meetings here in Maine, and afterwards I talked with him. He said that he always broke his seed when it was green rather than when it was ripe, and got better germination than when it was allowed to arrive at full maturity. I like to husk my corn, hang it in a cool, dry place, and then select my ears, hoping sometime to fix a type of corn that will in some degree suit me. I have not reached it yet. I get some good corn. I have not corn that I want to show yet, it is not as uniform as I would like to have it, nor the kernels as large. I believe we can materially increase the yield to the acre. If we get only 1,500 stalks, something is wrong with our seed. Something is necessary if we are going to minimize the waste.

Suppose you get a stand of about 12,000; 10 to 25 per cent of those are barren. Why is it? There are five or six reasons. First, the season; second, heredity; third, poor preparation of the land; fourth, want of proper plant food at the right time; fifth, lack of cultivation. Every one except the first depends considerably upon the care to the same extent; the poor season can be corrected by better attention to the land. The remedy is in our hands. I wonder if we are giving our attention to the matter of heredity. I was impressed by taking samples of corn from numbers of mine, raised by men who had used the utmost care through a series of years, to find such variation in growth and yield. One of the factors which we ought to count is to find the environment which is adapted to seed corn. Some varieties will thrive in some sections and fail in others. We ought to work out this problem. If you have a variety that is doing well for us, try to improve it, giving it the care and attention and fertilization necessary. I use, at the last cultivation, a little fertilizer that carries three and one-half per cent of nitrogen.

The color of the stalk, the amount of leaves, the development of the ear, the length of the ear, we touch there what is absolutely necessary and is vital to us if we are going to grow corn. I am not particular about the type here, because I think it tends to shorten the ear, and I want to reach out and increase the length of the ear. It is well to take any point to start with; we should seek to encourage the length of the ears, their growing closely, the early maturity of the corn and to increase the number of the kernels on the ear. These are problems that I intend to keep at until I find out something that suits me. I was pleased in passing over a number of samples of Dr. Woods, to see that the protein content of the corn run from 10.65 to 12.65. These were grown by farmers who knew nothing of science, but, because of their selection of seed, their soil, or some other reason, they have increased their protein content. The farmer should consider that in addition to the length of ear, number of kernels, etc., he should seek to add to the food value of the corn itself. It is a great problem, one which we need to study.

GROWING CROPS WITHOUT POTASH IN 1916.

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

"And Pharaoh commanded the same day the taskmasters of the people, and their officers, saying, Ye shall no more give the people straw to make brick, as heretofore: let them go and gather straw for themselves. And the tale of the bricks, which they did make heretofore, ye shall lay upon them; ye shall not diminish ought thereof. And the taskmasters of the people went out, and their officers, and they spake to the people, saying, Thus saith Pharaoh, I will not give you straw. Go ye, get you straw where ye can find it; yet not ought of your work shall be diminished. Then the officers of the children of Israel came and cried unto Pharaoh, saying, Wherefore dealest thou thus with thy servants? There is no straw given unto thy servants, and they say to us, Make brick: and, behold, thy servants are beaten. He said, Ye are idle. Go therefore now, and work; for there shall no straw be given you, yet shall ye deliver the tale of bricks."

Bricks without straw! Crops without potash!

For more than a generation New England agriculture has been dependent upon the purchase of plant food in the form of commercial fertilizers. It has been a matter of great concern to those officially interested in New England agriculture that it has not been self-sustaining and that it has been necessary to look outside of its borders for the needed extra plant food. A most cursory examination of statistics indicates that with the introduction of commercial plant food, New England agriculture has steadily advanced, not only in the total yield but in the net profit per acre. There are very few present who remember when potash was made an essenial part of commercial fertilizers. This occurred in the early seventies. Up to that time the fertilizers chiefly used were guano and dissolved bone black. These carried nitrogen and phosphoric acid but no potash.

Many experiments have been made and many treatises have been written showing the value of potash in agriculture. The experimental data showing how crops can be grown without potash are few.

Recognizing the dearth of information and the prime importance of the subject, the directors of the New England, New Jersey and New York Experiment Stations held a special meeting recently to discuss this subject and arrive at definite recommendations for the crops for 1916. The paper which I present today is based upon this discussion and the conclusions there reached, supplemented by a few special studies that have been made by the Maine Agricultural Experiment Station, chiefly at its Aroostook Farm.

In the first place, there is no known substitute for potash in agriculture, nor does any royal road, whereby the present crisis due to the shortage and practical absence of potash salts from the market may be overcome, exist. But there are certain ways and conditions that can help tide over the present crisis. The situation is, however, still farther complicated by the fact of an advance in price of practically all kinds of plant food. Sulphuric acid, which is essential to convert the insoluble phosphates into available form, is in such a demand for the manufacture of explosives that its price has been greatly augmented, thereby increasing the cost of available phosphoric acid. Nitrates, which are used in the manufacture of explosives as well as being a fertilizer, come chiefly from the west coast of South America. The deflection of enormous amounts of nitrates because of this unusual activity in the manufacture of explosives, coupled with the fact of the blocking of the Panama Canal, has greatly increased the price of nitrate of soda and reduced the amount that is actually available for agricultural purposes in 1916.

Usually it has been practicable to get the supply of nitrate of soda by the long route around the Horn, and a few vessels are now on the way from Chili. But the diversion of merchant ships for war purposes has increased the cost of ocean transportation enormously. This is also accompanied by an actual shortage of vessels sufficient to handle the world's commerce. It is hoped that the Canal will be opened early in 1916, and it may be that nitrate of soda can be abundantly purchased in the spring months. It is, however, to be remembered that most of the commercial fertilizer which will be used in Maine in 1916 is already manufactured and much of the goods are today in Maine's warehouses.

General Suggestions.

In view of the high price of all commercial plant food and the exceedingly short supply of potash it seems opportune to again impress upon all growers of crops the importance of the fundamentals that have been urged so repeatedly upon the farmers of Maine. At no time in our history should good tillage be practiced more than in 1916. The thorough working of the soil, careful preparation of the seed bed, frequent cultivation while the crops are growing, all tend to make more available the plant food which is in the soil. All plant food which in the past has been so commonly allowed to go to waste should be conserved. There should be special care of manure, so that the waste from fire-fanging and leaching will be reduced to a minimum. Special attention should be given to the use of absorbents and to water tight stable floors so that the urine, which carries the potash which comes from the food fed to the animals, is not wasted. This is the time, of course, for the utilization of household ashes, brick kiln ashes, factory ashes from wood, and particularly for people along the seashores to utilize the abundant supply of nitrogen and potash found in seaweeds. It is the time to utilize the muck deposits for making composts and after drying for use as a stable absorbent. The importance of composting all waste materials not in readily available form as food for plants has not been so marked at any time in the memory of any present as it is today. In this composting and mixing of refuses it is necessary to keep things that are incompatible apart. As, for instance, ashes or lime should not be added to commercial fertilizers direct, nor should they be added to hen droppings or stable manure.

The Sources of Plant Food.

SOILS.

The first great chief source of plant food is in the soils themselves. Soil from an acre to the depth of a foot weighs approximately four million pounds. Good typical potato soils in this state, analyzed by conventional methods, will carry pretty nearly a quarter of a per cent of nitrogen, a quarter of a per cent of phosphoric acid and three-tenths of a per cent of potash. Small as these percentages are, it means enormous total weights of ingredients in an acre. A good fertile soil will carry to the depth of a foot upwards of four tons of nitrogen, four tons of phosphoric acid and over five tons of potash—obviously enough for hundreds of crops if this supply could only be made available for the use of crops.

A ton of farm manure carries only about twice as much plant food as a ton of good soil. But in the manure the plant food is all or nearly all available, while in the soil it is for the most part beyond the reach of the plant. It is one of the aims of good agriculture to render available as much of this plant food of soil as is possible. And this is of unusual importance under present conditions.

In general, light sandy soils contain less potash than heavier soils. Hence, in 1916, for most money crops it is advisable to use only the better soils. In general, only soils that are in good tilth and good state of cultivation can probably be profitably used with the type of commercial fertilizers that will have to be employed in 1916. Of course the value of the crop must be taken into consideration, for with some crops, such as onions, that have a high labor cost and where the fertilizer cost is relatively unimportant, it may be advisable to buy potash, if it can be had, even at the present high prices.

It is so important as to bear repetition. In Maine, only the best soils should be used for money crops in 1916.

STABLE MANURE.

A year ago the speaker called attention at this convention to the high value of farm manures which were largely wasted in the state. According to the State Assessors' Report for 1913, there were in the State of Maine, in round numbers, 130,000 horses, 250,000 head of neat stock, 40,000 swine, 120,000 sheep, and 2,000,000 hens, ducks and geese. If all the manure was saved from these animals it would amount in a single year to nearly 4,000,000 tons, and would carry approximately 19,000 tons of nitrogen, 12,000 tons of phosphoric acid and 18,000 tons of potash. This plant food in the world's market at normal prices would cost about $10,000,000—sufficient to buy 300,000 tons of high grade commercial fertilizer at normal prices. It is more than doubtful if by present methods of management one-half of this plant food is actually returned to the soil.

It seems to be difficult for the average farmer to really grasp the idea that manure should be as carefully preserved from unnecessary losses as any other product of the farm. The large bulk of the material, the insidious losses, the ease with which commercial fertilizers have been obtained in the past, the expense of properly providing for storage and the application of manure to land, and the lack of proper understanding of the value of manure and the large losses which prevail under ordinary farm management, are among the reasons which have led to this neglect.

While it is customary to compare farm manure with fertilizers on the basis of their content of nitrogen, phosphoric acid and potash, this comparison is not adequate for determining the relative values, since manure serves certain purposes fertilizers cannot serve. Farm manures are of very complex composition. They contain more or less of all the elements contained in the food given to the animals and in the litter. They are rich in organic matters and are composed chiefly of vegetable substances. Organic matter is the source of humus in the soil and is of high value. Soils need humus and this can only be supplied by the addition of organic matter in farm manure or by plowing under green crops.

Urine is by far the most valuable part of the excreta of animals. It contains much of the nitrogen and practically all of the potash excreted. It is not sufficient to save the solid droppings, but the liquid should be collected as well. If the present dearth of potash should lead Maine farmers to conserve Maine's millions of dollars worth of plant food which are now being neglected through lack of care in the collection and handling of farm manures, it would largely help to offset the losses due to a potash shortage. If the lessons of 1915 have brought home to the farmers the necessity of greater care in the handling of these waste products of the farm, it has not specially come to the speaker's attention!

A cord of ordinary stable manure weighs from two to three tons and will carry, roughly speaking, a half a per cent of nitrogen, a third of a per cent of phosphoric acid and a half a per cent of potash. That is, a cord of manure will carry about 25 pounds of nitrogen, 17 pounds of phosphoric acid and 25 pounds of potash.

WOOD ASHES.

Of all the sources of potash natural to Maine, wood ashes are perhaps the most important. Wood ashes carry potash and lime. The amount of potash varies greatly with the kind of wood, the temperature at which it is burned, and the subsequent treatment of the ashes. Good hard wood ashes will carry in the neighborhood of five or six per cent of potash. They will also carry pretty nearly 50 per cent of lime. The most of the ashes of commerce, even though they are branded "Unleached" have lost considerable of their potash in one way or another. One brand of so-called "Canada Unleached Ashes" was offered in New York last year with a guaranty of only one per cent of potash. Ashes come under the requirements of the fertilizer law, and in buying ashes one should insist upon having them sold under guarantees of potash and of lime. The phosphoric acid which they carry is unimportant.

SEA WEEDS.

The ordinary deep water and shore sea weeds are valuable natural sources of potash and of nitrogen. Winter collected sea weeds, both rock weed and kelp, carry about 80 per cent of water and 0.4 per cent nitrogen, 0.1 per cent phosphoric acid, 0.6 per cent potash and 0.5 per cent lime—considerably more than is contained in farm manure and equally available. Like farm manure, on account of their large water content sea weeds cannot be economically transported far from the point of origin. The ashes of sea weeds are rich in potash. Eel grass has no agricultural value. Mussel mud has value but will not warrant large amounts of paid labor.

LIME.

Lime is still a cheap product, and under some conditions it is a valuable addition to the soil, both to liberate the plant food from the organic matter of the soil and to correct acidity. It is also a plant food and is essential to crops. Clover and alfalfa, in particular, require it. It can be had in the oxide (that is, burned lime), the water-slaked (hydrated lime), or the carbonate (air-slaked lime and ground limestone.) Lime and ashes tend to make a soil alkaline and an alkaline soil is favorable to the growth of the fungus which produces potato scab. Hence care should be taken that large amounts of ashes and lime are not applied to a soil where potatoes are to be grown.

Commercial Supplies of Plant Food.

MINERAL AMMONIATES.

Calcium cyanamid at present prices is probably the cheapest source of commercial nitrogen today. The amount that can be safely used in mixed goods is limited, probably not more than 200 pounds per ton. Cyanamid nitrogen contains free lime and hence is incompatible with sulphate of ammonia, and also if allowed to stand in mixed goods, it might have a tendency to revert the phosphoric acid. Nitrate of soda is the most speedily available of all ammoniates. Cyanamid nitrogen is probably as available as sulphate of ammonia and more available than dried blood. In a cold climate such as ours and with crops like potatoes which demand early growth, nitrate of soda is valuable and it will probably have to be used in our climate in 1916 despite its high price.

Sulphate of ammonia gave as good results as nitrate of soda with potatoes at Aroostook Farm last year, but plot experiments indicate that it is only from 75 to 80 per cent as available as nitrate of soda.

ORGANIC AMMONIATES.

These practically all come from refuse sources. Most of the organic ammoniates are high in price, but they will still have to be used in mixed goods to a considerable extent. Tankage, cotton-seed meal, blood and fish are the standard sources. People living near the wool factories in Maine may find wool waste a valuable source of nitrogen. It also will carry some potash. Wool waste should be composted before using. Along the shores, if they can be cheaply obtained, starfish are quite a valuable source of nitrogen. Dried starfish carry about five per cent of nitrogen, two per cent of lime, but practically no potash or phosphoric acid.

PHOSPHORIC ACID.

Bone and the mineral phosphates which are found from fossil bones are the sources of commercial phosphoric acid. The finely ground mineral phosphates, called floats, may have some place in our agriculture with the advance in price of acid phosphate. These have been largely recommended for use in the Middle West. It is to be remembered that the value of their crops per acre is only about a third of that of the average crop in New England. The more available acid phosphates, even at a higher price, have proven to be economical for New England conditions. In no case would the speaker advise the use of floats for direct application to the land for most crops, as they are slow in action. In Ohio they have been found to be a valuable addition to farm manure.

Basic slag is a good alkaline source of phosphoric acid, but its price is probably too high to be considered in 1916.

Both bone and bone tankage are much more available than floats. Of somewhat slow action they are valuable in making up a part of the phosphoric acid in mixed goods, whether these be home or factory mixed.

Acid phosphate is still the best source of phosphoric acid for Maine farms. The price this year is, however, high. Quickly available phosphoric acid has a tendency to hasten the development of the root system of plants, and for this reason it is particularly valuable for crops that need to make an early growth. Starting the plants early in this way gives them a longer season and makes it more possible for them to utilize plant food in the soil than would otherwise be the case.

POTASH.

Feldspar carries considerable potash, but experiments have not shown it to be of any direct value as applied to land. There are patented processes for extracting potash from feldspar which would doubtless come into practice were it not for the fact that as soon as the war is over potash will probably go back to its normal price.

There are no methods of extracting potash from feldspar thus far devised that are economically possible under normal potash prices. While it is hoped that supplies of potash may be found that will make this country independent of foreign sources, not enough will be produced before planting time to at all relieve the present shortage.

Outside of a limited amount of ashes, available potash is practically unobtainable for most crops. Commercial fertilizers for 1916 will, for the most part, be made to carry no potash or at the most, only one per cent. This one per cent will add five dollars to the cost of fertilizer per ton.

POTASH LIBERATORS.

There are no such things as potash substitutes in agriculture, but some materials, such as the sodium and calcium salts, will under certain conditions more or less replace the potash in the soil and render it available for the growing of plants.

Among the soda salts are nitrate of soda, soda ash and common salt. Gypsum (calcium sulphate) is the most important calcium salt. Alkaline sources of lime and soda such as calcium carbonate and lime and of soda ash, do not seem to be so effective in releasing the potash of soils as are the chlorides and nitrates.

Field experiments conducted for twenty years at the Rhode Island Experiment Station seem to indicate that soda has considerable value in releasing potash for certain crops. There was very little gained from the use of common salt with the potato crop. This experiment indicated during its whole course that the application of soda to the granite soils helped to insure the production of normal crops, even without the addition of potash. At the Experiment Station at Rothamsted, England, nitrate of soda has been found to be of marked value in the growing of crops, irrespective of the nitrogen which it carries. Doctor Hall, in reviewing this work, states that "It is not sufficiently realized how valuable a soda base may be. This is not because the soda is in any way necessary to the nutrition of the plant but because of the action of any soluble salt upon the insoluble potash compounds in the soil. The potash in the soil is due to the partial weathering of double silicates like feldspar and of clay, which is not to be regarded as pure kaolinite, but as containing a certain proportion of zeolitic bodies immediately between feldspar and kaolinite. Any soluble salt, and particularly a soluble soda salt, will react with these zeolites and exchange bases to an extent depending on the relative masses of the two bodies, hence nitrate of soda acts on the clay of the soil and brings some potash into solution. To a certain extent this action takes place and in practice the dressing of nitrate of soda, on any but the lightest soil, will dispense with the necessity of a specific potash manuring, even for potash loving crops."

No experiments in New England have been made along this line with the exception of a limited amount at the Amherst, Massachusetts, Experiment Station. The soil there is a silt, and not granitic in its origin. Director Brooks did not find any specific benefit from the application of nitrate of soda to that soil as a liberator of potash.

Lime (calcium oxide), slaked lime (calcium carbonate) or ground limestone (calcium carbonate) is helpful in liberating potash from the organic matter of the soil. The effect of lime upon the mineral potash of a soil is not so well determined, and there is a difference of opinion. The best New England authorities think that it has little or no effect in freeing mineral potash.

Gypsum (calcium sulphate) has been found to have some effect in replacing potash in the soil. Its price, however, is probably too high for general application the present year. Acid phosphate, however, of necessity always carries gypsum. Hence all mixed fertilizers containing available phosphoric acid also carry gypsum. In general, multiplying the available phosphoric acid in a fertilizer by two and a half will give the approximate pounds of gypsum in fertilizers. That is, an acid phosphate carrying 16 per cent of available phosphoric acid will carry about 40 per cent of gypsum. A ton of fertilizer with ten per cent available phosphoric acid would carry about 500 pounds of gypsum.

Mixed Commercial Fertilizers in 1916.

The present year fertilizers may be had ranging from one to six per cent of ammonia, from eight to ten per cent of available phosphoric acid, and without potash. Also fertilizers carrying from one to five per cent of ammonia, eight to ten per cent of available phosphoric acid and one per cent of potash will be upon the market.

In special instances it may be possible to get a fertilizer carrying more potash.

The prices for mixed fertilizers were fixed in October last. The prices for potash are based upon a value of about $250 per ton for muriate at that time. Today potash salts are worth considerably more—probably double that amount. These prices make potash worth $5 per unit. Hence, a fertilizer with one per cent of potash would cost $5 more per ton than if the potash were omitted. Much, if not all, of the fertilizer offered in Maine the present year will carry a considerable part of its nitrogen in the form of nitrate of soda. It is urged that the purchaser of mixed fertilizers in 1916 make sure that at least one-fourth, and, still better, one-third, of the nitrogen the fertilizer carries is in the form of nitrate of soda.

Growing Potatoes Without Potash.

Potatoes are the chief cash crop grown in Maine. It is of first importance for the grower to have what facts are available relative to the likelihood of obtaining a crop in 1916 without the application of potash. Foreseeing the possibility that the fertilizers in 1916 would contain very little, if any, potash, the Maine Agricultural Experiment Station began in 1915 at Aroostook Farm a series of experiments to determine the effect of different amounts of potash. Four different mixtures were used. In each case the fertilizer contained four per cent of nitrogen (five per cent of ammonia), of which one-third was in the form of nitrate of soda, and eight per cent of available phosphoric acid. The potash varied as follows: On one plot there was none, on another two per cent, on another five per cent and on another eight per cent. The plots were one-half acre each and they were planted in duplicate. The land had been in grass for two years, one year in oats and the year before that had been in potatoes. No fertilizer had been used since the potato crop of 1911. In each case the fertilizer was applied at the time of planting, at the rate of 1,500 pounds per acre. Other than the amount of potash used, all the plots were treated exactly alike.

Throughout the growing season the vines on both the no potash plots were a distinctly brighter green and had a thriftier look than on the adjoining plots. The difference was so marked that it attracted much attention from visitors at the farm. Although some slight irregularities occurred in the yield from the different plots, the average figures show fairly consistent increases with the increase in potash. The plots without potash yielded 110 barrels or 302 bushels of merchantable potatoes. The plots with two and five per cent potash gave practically the same yields of 116 barrels or 320 bushels per acre. The eight per cent potash plots averaged to yield 120 barrels or 331 bushels per acre. This is an increase of ten barrels from the eight per cent plots over the no potash plots. This amount is undoubtedly large enough to be significant and to indicate that the potash increases the yield of potatoes in Aroostook county. On the other hand, 110 barrels (302 bushels) per acre is a good yield—considerably above the average and nearly double the average in the county in 1915. So far as the results of this one year are concerned, they indicate that a profitable yield of potatoes can be obtained on Aroostook soils without the addition of potash for at least one year. In a few farmers' trials made by the various fertilizer companies, in which no exact records were made, satisfactory results were obtained without the use of potash by all of the growers from whom the Station has heard. Quite a number of farmers tested mixtures containing varying amounts of nitrogen, phosphoric acid and without potash. The consensus of opinion seems to be that a five per cent ammonia and ten per cent phosphoric acid gave on the whole the best yields. Based upon the reports of these trials, a good many of the fertilizer companies are increasing the amount of phosphoric acid the present year. Fertilizers that normally carried eight per cent will in 1916 carry ten per cent available phosphoric acid. To the speaker this increase in phosphoric acid does not seem to be necessary. Outside of the special fertilizer experimental plots at Aroostook Farm and at Highmoor Farm, the fertilizer to be used in 1916 will carry five per cent ammonia (with one-third of the nitrogen in the form of nitrate of soda), eight per cent available phosphoric acid, and no potash.

Experiments at Massachusetts, however, indicate that available phosphoric acid hastens the development of the plants at the beginning of the season and that would seem to be borne out by the farmers' experiences cited above, where they had compared ten per cent available phosphoric acid against eight per cent available phosphoric acid. The fertilizer companies state that the difference in cost between a fertilizer carrying eight per cent and one carrying ten per cent available phosphoric acid in 1916, will not exceed $1.00 per ton. It may be that this added phosphoric acid may be found profitable. Based on the 1915 results at Aroostook Farm it would not pay any man to buy potash at the present price of $5 per unit, even if it could be obtained. The increase of ten barrels of potatoes per acre where eight per cent of potash was used over where none was used was worth at harvest about $15. Eight per cent potash, if it could be had, would cost not less than $30 per acre for 1,500 pounds of fertilizer, which is twice the value of the increased crop.

For potash liberators the evidence is preponderant in favor of nitrate of soda. There is little evidence that common salt frees any perceptible amount of potash which will become available to the potato crop. Gypsum (calcium sulphate) probably will help render the potash available. A fertilizer carrying five per cent of ammonia, in which one-third of the nitrogen is in the form of nitrate of soda, and carrying eight or ten per cent of available phosphoric acid, will have theoretically enough sodium from the sodium nitrate and calcium from the calcium sulphate (gypsum) to liberate enough potash for a maximum crop of potatoes.

The speaker, therefore, would advise the use of 1,500 to 2,000 pounds of a fertilizer carrying five per cent of ammonia, with one-third of the nitrogen in the form of nitrate of soda, and eight per cent or even ten per cent of available phosphoric acid and no potash, for 1916. With people who have been getting good results from a fertilizer carrying four per cent of ammonia, a 4-10-0 fertilizer would probably prove satisfactory.

Conclusions.

Crops can be successfully grown without potash under certain conditions. It is not believed, however, that New England agriculture can be successfully maintained at its present high rate without the purchase of plant food, including potash. However, for the year 1916 under the emergency, it is believed that agriculture may be successfully prosecuted if the following conditions are observed:

Select for the money crop only soils that are known to be in good tilth and in good heart. Avoid, so far as possible, the light sandy soils of the state.

Pay special attention to plowing, harrowing and cultivating, so as to "fine" the soil as much as possible. Tillage renders the plant food of the soil much more available.

Properly conserve all of the possible available plant food from waste. This can be utilized by composting or by applying directly to the soil. Composting makes unavailable sources more available.

Spread the farm manure over a greater area than ordinary, and supplement by the purchase of commercial fertilizers without potash.

The following specific recommendations are given, not that they are the best or that they may give high financial returns, but with the belief that despite the lack of experimental data, following these recommendations will lead to satisfactory results. Be sure to insist that at least one-third of the nitrogen in mixed goods be in the form of nitrate of soda.

Top-dressing Grass Land, Winter Rye, Etc.

Ammoniates. Nitrate of soda is without doubt the best ammoniate for top-dressing mowing lands. The high cost the present season may make it desirable to use some other form. Sulphate of ammonia is a good top-dressing. Probably cyanamid used by itself would make a good top-dressing. Equal weights of cyanamid and nitrate of soda would be useful for this purpose. Cyanamid cannot, of course, be used with sulphate of ammonia. Any of these materials can be used at the rate of 100 to 200 pounds per acre.

Phosphoric Acid. Because of the high price of available phosphoric acid the present year, its use may not be found profitable.

Wood ashes and stable manure are useful for top-dressing.

POTATOES, ROOT CROPS AND MORE COMMON VEGETABLES.

If possible, use eight or ten tons of stable manure per acre with about 500 pounds of 3-10-0 goods. If farm manure cannot be obtained, use 1,000 to 2,000 pounds of 5-8-0 or 5-10-0 goods.

CORN.

It probably is not profitable to attempt to grow corn without farm manure. Use 20 to 25 tons of manure per acre. In addition to the farm manure, use 300 to 500 pounds of 3-10-0 fertilizer.

OATS AND SMALL GRAINS.

Spring seeding down with oats or other grains or grass should follow about the usual places in the rotation. In case the land was heavily fertilized in 1915 it may not be necessary to fertilize in 1916. If fertilizer is used 300 to 500 pounds of a 5-8-0, 5-10-0, or 6-8-0 fertilizer is the best that can be had under the conditions.

ORCHARDS AND FRUITS.

The present year clean tillage seems to be the thing that is indicated for apple and similar orchards rather than to use any fertilizer. Raspberries, and the other small fruits would have to be handled practically as recommended above for the root crops and more common vegetables.

SOIL IMPROVEMENT.

PROF. FRANKLIN MENGES, York, Pa.

(Stenographic Report.)

This is the most important subject before the American people today. The subject is "Natural Methods of Soil Improvement," or "Nature's Methods." Those of you who have been farming quite a while and have been observant, have noticed that under certain conditions your land will improve naturally, whereas, under other conditions, it will become poorer. Now, then, in order that we may have an idea about these things, we will have to go directly to Nature. We will have to go down to the soil and see how it was made and how it is being made today. If our geological evolution fellows can be trusted, there was a time when this old earth was nothing but solid rock. I do not know whether that is so or not. I am saying what some other fellow said. I have a sneaking sort of a notion that we do not know.

We notice in our state that on the solid rock, and this is true in Maine as well as in Pennsylvania, and all over the United States (I have traveled over a good part of it), that on the solid rock there are plant growths, the lowest visible form of plants that we know anything about, the mosses, lichens and the algæ. What are they? Soil makers. If you examine the texture of the rock, you will find that the roots of the plants have penetrated the crevices of the rock and taken from the rock the material used for growth. They go on soil making. When they have made a soil sufficiently rich another plant will come along and grow on it. What is this other plant? It is the fern. We have species of ferns that will grow well-nigh on the naked rock, and spread from the base to the top of the solid mountains. You have older mountains here, I think, than we—they are not as high. We still have coal in our state, and lots of it. I think you wish you had.

After the ferns have developed soils rich enough for another plant to live, that other plant comes along. It is the fire cherry. It is God Almighty's means to prevent careless people from causing fire to destroy forest growth. I always say that whoever sets the woods afire ought to have his taste of purgatory right there, because that is where he is going, anyway. This is rather plain talk. This is His agency to prevent the absolute destruction of the soils on the hills and mountains of the State of Pennsylvania. We know how roots and seeds are destroyed by fire, and when every little seed has been killed, by some means, I do not know how, that little cherry gets there and prevents the soil from being destroyed by man, the very agency on which he depends to get his living. After the fire cherry, with us (I have been in every county and town in the state), comes the huckleberry, and after the huckleberry comes the little cedar, and after the cedar comes the hemlock, and after the hemlock the pine. The State of Maine is noted for its pine. The northern part of Pennsylvania has large areas of pine. We are too far south for the white pine you have. In the southern part, we get into the southern pine district. After the pine comes the birch, after the birch the beech, after the beech the maple, after the maple comes basswood; then pin oak, rock oak, black oak, swamp oak and white oak. Where do we find the white oak? We find it in the richest soil in the state. We find it in Pennsylvania, in the limestone valleys of that state. Pennsylvania Dutch settled in the limestone valleys and are there today. They knew a good thing when they saw it. Here is a process of development. The longer the Almighty farmed that land the better it became and the longer some fellows I know farm it, the poorer it becomes.

Now, notice that I said here is a process of development. Our soils are made up of two substances, disintegrated rock and organic matter; rock out of the earth, and organic matter out of the atmosphere, and the two are brought together through the agencies of the leaves of our plants. How does the organic matter get into the atmosphere? You and I are factories which make some of this organic matter; we inhale air composed largely of oxygen and nitrogen and when we breathe out the air it is made of carbonic acid gas, which the plants breathe. If I should seal this room up and lock you in until night, about seventy-five per cent of you would be dead. The waste material that you cast off your bodies would kill you. It is not necessarily a poison, but it does not contain oxygen enough to purify your blood and sustain life. I exhale a little and you breathe it in. You would not eat that way. Why do not people ventilate better? The Lord knew better than that. He did not want all this waste material floating about in the air. The waste material that comes from the engine along the railroad track is waste material from the fuel consumer. The Lord made a plant and gave to its leaves the power to take up this waste material and utilize it. The chair was once waste material; the wood from which it was made came from the oak tree, the leaves of which had the power to take up the waste matter and make wood out of it. Do you know that the bread and the potatoes you ate for dinner, last summer were waste material floating in the air which came in contact with the leaves of the potato plant, and the leaves had the power to take it up and make potatoes of it. The same is true of the corn, the peach, the apple and the pear. You ate for your dinner what your grandfather had eaten before you. Your grandchildren will eat what you have eaten. This is the cycle of construction and reconstruction going on forever.

God gave to the farmer the mission to produce food for the race. He is God's right-hand man and he ought to be a good one. If he is not, he ought to stop farming. He is the agent who furnishes human nutrition, and it is the greatest business in all the world. Before we can have facilities for manufacturing, transportation, and before we can have even religion, we must be fed. I do not like starved Christians. They do not look good to me. Here we have a constructed agency out of the two materials, and the longer the Almighty farmed with them the richer that agency became. This brings me to another subject.

There are two kinds of farmers—constructive farmers whose farms get better, and destructive farmers whose farms get poorer the longer they farm them. You belong to one class or the other. Do you know that nine-tenths of all the farmers in the United States belong to the last class? It is a broad statement; I wish it were not true. I believe that you and I have been put into this world to help the Almighty to make things better. Don't you? If you cannot help to make the world better, you ought to go where you belong. I do not know where that is.

Let me say another thing. There is no man in this world who can help to make things better more than the farmer. He can help to do more to make this old world better than any other fellow, because he is not tied down to anybody, unless he has a mortgage on his farm. He is independent and once in awhile he can say what he wants to say and think as he pleases, and you know a lot of them do. This is true among the Dutch, and they say it in Dutch, too.

I say there are two classes of farmers, the constructive and the destructive, and nine-tenths belong to the destructive class. You would like to have me tell you who are the constructive and who are the destructive farmers. Our soils are made up of two substances—organic matter and disintegrated rock; the one comes out of the atmosphere and the other out of the earth. When you and I raise these crops on the farm we should do as the Almighty did with the woods, which produced a crop of leaves every year and which fell on the ground and rotted away and, by and by, the trees themselves died, rotted away and went back to the soil. When we came along we cut away His agency of soil making—the trees; and then we began farming. We began to raise crops and we did not put back into that soil as much as we farmed out of it, did we? The destructive farmer is the man who does not put as much organic matter back into the soil as he takes out of it. The constructive farmer puts more organic matter back into the soil than he takes out and that fellow is working for a permanent agriculture. This is what the Almighty did. The longer he farmed this land the richer it became.

The problem before the American people is to work for a permanent agriculture; commercial fertilizer will not do it, nor any other agency but the crops grown on the farm. I use commercial fertilizers to help me to get to the point where I will not have to use it, or to supply something in which my soil is naturally deficient. Another thing we do on these farms; we raise soil-exhausting crops and soil-improving crops. The longer we raise one kind the poorer our land becomes, and the longer we raise the other kind the better our land becomes. The Almighty did not leave us in ignorance about these things; He gave us plants by which we can construct and maintain the fertility of our land. In Pennsylvania we have a crop rotation of corn, oats, wheat, and wheat and grass, usually timothy. Corn, oats, wheat and timothy are soil exhausting crops, and in this rotation we have one clover crop in four years, which does not suffice to keep up the fertility of the soil.

I cannot get the Pennsylvania Dutch to change their rotation. We get them to put crops into their rotation to improve the land, and the probabilities are you can get some idea out of what I am saying to help you up here. With the corn, we now sow cow peas at the last cultivation. This last summer I had the pleasure of having a growth of cow peas two feet high. We cut the corn, put it into shocks, and then we got into the field with a disk harrow and cut up the peas and the corn stubble, and then sowed it with wheat, and with the wheat a fertilizer composed of 1,200 pounds of Basic slag, 600 pounds animal tankage and 200 pounds nitrate of potash. This mixture cannot be obtained at this time, but instead we make up a mixture of 1,200 pounds dissolved potash rock, 500 pounds animal tankage and 300 pounds hydrated lime. These ingredients must not be mixed until they are to be sown, because the mixture will become hot and lumpy and cannot be sown. It works fine. Why? Because it cannot help itself. In this section you could use crimson clover, if you can get it started. The Canada field pea sown with the corn might do splendidly here. The Soy beans will frost kill as well as the cow pea, but not as soon. Your soil may get sour, and the reason we put lime in is to prevent anything like that from occurring. They are all right after they are in the soil. I believe that in southern Maine the cow pea would do all right.

You have in the Canada field pea a soil improving crop sown with the oat. After these, the land is seeded down with clover. I believe that alfalfa and timothy seeded together in this state would make a splendid combination. I know where it does well, and I believe it would do well here, if you get your land up to the condition where it would grow alfalfa. If you cannot raise red clover, get a soil improving crop with the oats, and a soil improving crop after the oats. The man who handles his farm in this way and feeds whatever he produces to stock and hens for milk, butter, eggs, etc., that man will improve his farm.

DISCUSSION.

B. Walker McKeen.

I appreciate the privilege of speaking once more to Maine farmers. I realize the difficulty of a man like me following a man like the one who has been speaking to you, who really "Beats the Dutch." I know something about Dutchmen, and have been associated with some of them in my work, and expect to be associated with them in the world to come.

This subject is a matter of great importance. It makes no difference whether a man is a farmer, a fruit grower, or whatever branch of agriculture he follows. I hope we may all take home with us the speaker's idea of soil improvement. I consider he is correct when he says the farmer is the Almighty's right-hand man, but the Almighty had the advantage over man when he planted his forests to feed the soil. He was planting the crops for the soil's benefit and after planting, left them there. Not so the farmer; of necessity he must take a part of what he grows from the land. It is more necessary for us farmers to study along these lines than for the Almighty himself, who had these things at his command. I have believed for many years that the secret of soil building and keeping was not so much a matter of fertilization as it was of giving into the soil organic matter, and of keeping it in the soil, after getting it there.

I have an idea that the State of Maine is suffering from an epidemic of root-bound grass fields. I believe we should strive to break up these old grass fields. Every year there is less organic matter in these old fields. Every year there is less that the Almighty put into the soil. In order to break them up we must use the plow. The plow is the key which is going to work the safe for us; which will make it possible for us to succeed in agriculture. The plow may be a soil destroyer as well as a plow. The intelligent use of the plow is being forced upon us more and more. We must make a more careful tillage of the soil. I would sell anything from the land that my circumstances permit and my market requires. I would not confine myself to anything, whether it was soil exhausting crop or not, and I would provide to maintain my soil after it. Live stock husbandry is the best type of farming for us now, and will be for a long time. We can plan to make our crop rotation attend to this. It seems to me that the use of the plow, plowing deep, should form the foundation of our business in this direction first, with a larger rotation of crops, those crops adapted to our soil and climate.

I think, also, we must have a money producing crop in our rotation; something that will grow and bring us money. Sweet corn has been for some years that crop in some sections. Just how long it will be, we do not know. It matters not what the crop may be, if we adapt the rotation to it in such a way that there is no lack of the necessary nutrition; then it will produce us something. I am very much interested in the use of some crop that will give us a cover crop to go into the soil. I wish this might be studied by our Experiment Stations. Of course the cover crop is not as necessary in this climate as in the South, although in the years past we find that we have less and less snow, and our lands are exposed more to the weather than in former years.

Perhaps a little personal experience in the direction of soil building and crop rotation may be of interest to some of our hearers. Some years ago we started to build up the resources of our farm. On that farm was an old pasture, which had furnished pasturage for our cows for a good many years, and was rapidly growing up and becoming practically useless as a pasture, when the matter of improvement of our pastures was very much discussed under Secretary Gilbert. After looking over our pastures, planning how to benefit them, we decided that the land should be allowed to grow up to woods, and the amount of food supply for our cows be obtained in some other way. Today, that pasture contains one hundred thousand of good pine; that amount has been cut once before, and it is really the most valuable land we have. We use a five-year rotation in our fields: First, hoed crop, with manure applied to the land; second, grain sowed to grass and clover; third and fourth, clover and grasses; fifth year, pasture. This land is supplied with plenty of water from a well. All that is necessary is to change the fences. There is no waste in the fertilizing materials, nor in the droppings of the animals. There is no expense or loss of soiling food, as it is put on the pasture. That proved to be a wonderfully good method of soil improvement. All the waste matter of the animals was saved, organic matter was not lost; the soil was pulverized. It seems to me this is the way for the farmers of Maine, adapting their crops to their station and condition, which can be practiced very profitably.

We are certainly up against a very great difficulty at present in this connection, and it seems to me that the advice given by Dr. Woods is one that we must profit by. I should not forget the lessons that have been driven home to us during this convention, building the soil, the methods of building, putting in of organic matter. It has several functions to perform in the soil: First, an available plant food; next, it is a storehouse for plant food; the plant food that is put on land lacking in organic matter does not do the land as much good as on land that is full of organic matter. I like the way in which the speaker emphasizes the building of organic matter in the soil. We are hardly aware of our dependence upon the air. A little more than 90 per cent of all that these crops growing for human food use, comes from the air. Nothing is destroyed in Nature. Part of the stick of wood which came from the air goes back into it, leaving only a very small part of it in the stove, after it is burned.

I have great faith in the future of Maine agriculture; in the future of New England agriculture. I have had something to do with, and have known something of the agriculture of our state for many years. I have raised some of these exhibits which you see here. I believe this is but the beginning, and if the speaker could come here in 25 years, he could emphasize the statement that he made today, that the farmer is the Almighty's right hand man, because of the products he would see on our tables and in our halls.

GOOD SEED THE FOUNDATION OF SUCCESSFUL FARMING.

H. B. FULLERTON, Medford, Long Island, New York.

Most vital to the achievement of success in any one of the many branches of the greatest of all professions—agriculture, are the two factors seldom considered, either by the expert or the layman.

First, and by long odds, the most important of these two factors is the individual, for, in agriculture as in manufacturing or commercial lines of any description, it is the individual at the head of affairs who plans, directs, readjusts, enlarges, or contracts, foresees difficulties, prepares and perfects plans to circumvent them; who most carefully inspects and selects the raw materials or fundamentals which go to make up the finished product. It is the individual who, keenly observant of every detail, detects and at once corrects errors or omissions. It is the individual who, when the finished product of his factory or store is ready to be put upon the market, investigates with the greatest care, notes the points glutted or over-stocked and those short or under supplied and makes his shipments in accordance. It is the individual who is constantly on the lookout for improved or more attractive methods of packing and presenting his products. It is the individual who designs or who has designed a striking and attractive label or trade mark in order, not only to secure trade for his particular line, but also to secure for himself all the natural increase in demand that invariably arises through the thoroughly satisfied customer. The capabilities of the average man are ample to develop on each and every one of the items outlined as the basis of success in any business or profession.

By far the most important item of absolute necessity for agricultural success is the raw material from which springs the plant that is to produce the product or crop to be sold. In the case of the agricultural profession, this raw material is the seed which is to be planted and, strangely enough, though agriculture is the oldest of all professions and businesses as yet in these great and glorious United States, practically no attention has been paid to the standardization of seeds. Seeds of all descriptions have been taken haphazard from the corn bin, the grain elevator, the potato cellar, or the bag. Only here and there spasmodic attempts have been made to prevent cross fertilization of varieties and but half-hearted attempts are made at rogueing crops grown for seed purposes only. Few farmers there are in the United States who have ever seen any of their crops reach maturity, absolutely uniform in variety.

Legions there are who suffer big losses annually, because they fail to secure a particular variety of seeds they have ordered and for which they have paid. Close observation for the past seventeen years has demonstrated most forcibly the fact that seldom less than twenty per cent and sometimes as high as eighty per cent of many crops are lost to the farmer, because absolutely dead or extremely weak, imperfectly matured seeds have been furnished. In practically all other businesses, manufacturing or mercantile, the buyer of any material specifies, as does the farmer, exactly what he wants. He is given a price which he pays, and having carried out his part of the contract, demands and secures a particular item he specifies. If he finds the goods delivered differ in length, in breadth, or in thickness, in size, in shape, in color, in weight, or in strength, he demands a return of his money or, if he has not already paid, he refuses to pay and he further makes claim and secures damages to cover the time lost, the injury done his business and his reputation, whereas the farmer buys his raw material—the seed—by the pig-in-the-poke method. In the majority of cases, only finding out after his crop is matured what variety or mixture of varieties he purchased in the spring, and only the easy going, long suffering, unorganized farming profession would stand for what those who sell seeds call their non-warranty clause, which is the most remarkable acknowledgment that all who use it lack either the necessary knowledge to warrant them in selling seeds or that they lack either the ability or willingness to follow the common practice of all other kinds of business.

In any other line of business, than that of seed selling, a concern which would state year after year that it would not warrant or guarantee either the description, the quality or the productiveness of the goods it had for sale, would have to take down its signs and close its offices in thirty days, after announcing merely that it refused to guarantee the descriptions which it give as accurate. Seedsmen make the claim that they cannot be responsible for varieties because they do not know their growers. This of course simply means that they should either go out of the seed business or grow the seed themselves, buying only such seed, which for any reason they cannot raise, from growers with unassailable reputations, and it is part and parcel of the seed business, as of any other business, to be equipped with men and means, that they may by a frequent inspection know exactly the method pursued by their growers, the constant rogueing or elimination of weak plants, of plants diseased, and of plants other than the strain or variety being raised. That no seedsman can guarantee the number of pounds or bushels to be produced goes without saying, but there is no reason in the world why they cannot absolutely and without qualification guarantee that when they take the farmer's money they will deliver exactly what he has ordered. Furthermore, they can, without the slightest difficulty, deliver healthy, plump, sure-to-grow seeds, free of dirt, and dead ones, and as seed crops are gathered in the fall and not planted until the spring, there is ample time to test for vitality or germinating ability every seed they offer for sale.

Seed selection, even in its simplest form, is, as yet, strictly in the infant class in the United States. Nevertheless, the results already secured are so big that the slowest of "stand pat" folks of the farming profession have been shown good and plenty. Furthermore, there are few men entitled to call themselves farmers who haven't found out for themselves that seed selected from vigorous, big yielding plants, will yield a good dividend on the time and care spent in the selection. The notion that beans are beans and potatoes are merely potatoes is childish in the extreme. In a careful test of seventeen varieties of potatoes, well known and each one a favorite, in some section of the United States planted, cultivated and sprayed in the same way, yielded in 1913, all the way from 70 bushels to the acre to 423 bushels. This eye-opener was not conducted in the usual method of a hill or two or small plot, but was an acreage proposition handled according to the usual method pursued by the regulation farmer. As Long Island potatoes sold that year from 85 cents to $1.15 per bushel and, as all these 17 varieties sold for identically the same price, even the most thoughtless or the most shiftless will readily grasp the fact that there is a heap of money to be made in trying out varieties and then selecting seed for planting from the very best there is in the field. Corn showed on acre tests to run all the way from 42 bushels to the acre up to 175. Wheat, from 36 bushels to 51. Each and every one of these tests were made with seed purchased from well-known seedhouses and in practically every case, varieties, claimed to be the best ever, were selected. The methods pursued were identical in every case and followed the simple practices which proved so successful when used by the early settlers in each and every state of our great republic.

Here is the exact outline of method pursued. Acreage on which a cover crop of rye and vetch or crimson clover had held the rains of fall and spring and the snows of winter, and also held that tremendously valuable fertility found in top soils and which is annually blown out to sea or into the big woods, if winter's winds are allowed to sweep across bare fields, was first cut up with a rotary or disc harrow, cut north and south and east and west, in order to cut out the slabs so many farmers place in the bottom of their furrows and then wonder why their crops do poorly. After thorough discing we plow *deep*. Not the deep that so many eastern farmers mean, but the deep of the big crop regions of the west. Instead of four or four and one-half inches, we try for nine inches, and are not satisfied if we do not get at least seven and one-half inches. We have now laid in the bottom of our furrow well-broken-up soil filled with vegetable matter in the finest kind of condition to let the sub-soil moisture come through and to hold future rainfall. We further have started the finest kind of a chemical laboratory which works without watching, for this clover, this rye, this vetch and the roots thereof rot slowly and continuously, and the gases given off put in fine shape and ready for immediate use of the crop the immense amounts of potash, phosphates and other health giving mineral matters contained in all soils, but locked up and out of reach of our crop until something rots, either vegetable or animal matter, and unlocks the door of Nature's soil storehouse so that the crops' rootlets may enter in and get their fill of plant food.

When the plowing is done, once in three years, we spread on the surface from three hundred to five hundred pounds of agricultural or slaked lime. This we use because it is two to three years quicker than ground limestone has proven in our 17 years of farm practice demonstration. This we use in preference to quicklime, because it does not burn and injure man, beast and harness, and this more than pays for the slight increase in cost per acre. As soon as the lime is applied we lightly harrow it under. The rains and dews of early spring will dissolve all that is needed and carry it down to the green stuff we have turned under gradually and in ample quantity to keep our automatic crop invigorator working nights, days and holidays.

In my home section, Long Island, New York, for the last ten years with one exception, we have been able to plow in January, thus getting ready a deep reservoir to hold the moisture which always comes early in the year, and freeze out a lot of unwanted wild plants and injurious bugs. The freezes of February help us out in this line, besides pulverizing the soil. Early in March we plant many of our crops and start cultivation soon thereafter. This cultivation is kept up at intervals of ten days or two weeks, as needed, until the latter part of June when crimson clover is planted, as a rule, for this is our favorite fertilizer, for the only fertilizers we buy are seeds and lime. On potatoes our spraying is done thoroughly and as frequently as the season requires; generally, three times is enough. Last year, seven to nine sprayings were necessary, and even then the wonderful value of seed testing was shown by the fact that one variety of potatoes sprayed nine times lost 60 per cent of the entire yield, by rot, just plain wet weather rot which the extremely thin, soft skin was unable to keep out of the potato. Right side of this a variety, sprayed only seven times, lost to us between eight and ten per cent because the skins were tougher and thicker and kept out just the regulation old-time wet weather rot.

Seed selection has, in potatoes, increased the yield 27 per cent. On Quick Lunch, Irish Cobbler and Green Mountain, the increase was practically exactly the same, and as real potato growers on Long Island annually dig and haul 300 bushels and upward per acre, 80 to 100 bushels increase per acre makes the bank account look pleasant, and promptly develops many a dream into a reality.

We westerners talk as flat footed as we walk; furthermore, as you have noticed, our lung power is well developed and enables us to be long distance talkers. Therefore, while you more quiet, conservative dwellers along New England's rock bound coast, may feel that this heart to heart chat is long strung out, you will find, if you care to dig down, that my earnest endeavor from start to finish has been, to place before you in a simple way, the great value to the farmer of improved seed of every description and the part better seeds will play in bringing communities into true cooperation which, next to the individual and the seed, go to make up the equilateral triangular pyramid of successful farming, and firmer foundation does not exist.

RELATION OF YIELD TO COST OF PRODUCTION.

FRED RASMUSSEN, Professor of Dairying, New Hampshire College.

When asking a large number of average dairymen how much it costs to keep a cow per year, the amount given generally varies from $50 to $150 per year. On many farms, where dairying is carried on as a side issue, the cost of feed is often regarded as the sole item of expense in keeping a cow, while, as a matter of fact, when all items of expense are considered, the feed represents about one-half the total cost.

So many factors enter into the cost of producing milk that it is impossible for anyone to produce a set of figures which will fit every man's conditions. The productions per cow, the cost of feed, whether the feed is bought or raised on the farm, the money invested in buildings and equipment, labor, depreciation on equipment, and cows and other factors, influence the cost of producing milk.

In considering the cost of producing milk, the subject may, therefore, be divided into two parts, the cost of feed and the cost of overhead charges, represented by interest on capital, insurance, taxes, depreciation, veterinary services, etc.

COW AND THE FEED.

As the cost of feed is about one-half of the total cost of producing milk, the amount of milk obtained from a certain amount of feed consumed by a cow becomes one of the most important factors to consider. A cow uses food for three different purposes:

1st. For her maintenance.
2nd. For the fetus if with calf.
3rd. For production.

The question may be asked why does one cow in a herd produce 10,000 pounds of milk and another, given the same opportunities, only produces 4,000 pounds of milk. The answer is, one had the ability to eat large quantities of food and convert it into the milk, the other lacks the capacity to consume large quantities of food or she lacks the ability to turn food into milk. No cow ever produced a large quantity of milk without eating a large quantity of food. The amount of food a cow can consume is one of the important factors to limit the amount of milk produced and influence the cost of production.

The following data collected by Prof. H. C. Eckles, of Missouri Experiment Station, fully substantiates this statement.

Two registered cows of the same breed were bred so as to freshen one week apart. Records were kept of the amounts and composition of feeds consumed for each cow. They were fed exactly alike in regard to the composition of the feed and the intelligence applied to the feeding. When the cows were dry their actual maintenance ration for the year was determined.

The following table shows the amount of food consumed and the amount of products given by each cow. Subtracting the maintenance ration from total amount of food eaten, gives the amount of food available for production.

PORTION OF RATION AVAILABLE FOR PRODUCTION.

	Grain	Hay	Silage	Green Feed
Consumed per year ...	3434	2904	8778	4325
Maintenance	1200	1204	4818	
For Production	2223	1699	3960	4325
Good cow 8522 lbs. milk, 469 lbs. fat.				
Consumed per year ...	1907	1698	5088	2102
Maintenance	1065	1065	4292	
For Production	841	632	795	2102

Poor cow 3188 lbs. milk, 169 lbs. fat.

The figures show that the good cow consumed food enough so that she had 2223 pounds of grain, 1699 pounds of hay, 3960 pounds of silage, and 4325 pounds of green feed available for milk production, while the poor cow only had about one-third as much food available for milk production, and as a result only produced about one-third as much milk and butter-fat. It showed that it took almost as much food to maintain the poor cow as it did the good cow; in other words, it shows that, in order to have a profitable cow, it is necessary that she should be able to consume and digest large quantities of food above her maintenance ration.

It is understood, of course, that care is taken in compounding a ration suitable for milk production.

Relation of Yield to Cost of Production.

The following table gives the yearly records of 203 cows of the South Lyndeboro Cow Test Association, classified in order of the amount of milk produced.

No. of cows.	Lbs. of milk produced.	Average number of lbs. of milk per cow.	Average number of lbs. of butter fat per cow.	Average cost of feed per cow per year.	Average return per cow per year above feed cost.	Average cost of roughage per cow per year.	Average cost of grain per cow per year.	Average cost of producing 100 lbs. of milk.	Average cost of producing 1 lb. butter fat.	Returns for each dollar's worth of feed consumed.
8	10,000—over	10,875	380.37	$88 59	$106 82	$37 33	$51 26	$ 81	$ .2328	$2 21
14	9,000-10,000	9,396	343.43	88 25	79 18	38 23	50 02	93	.2592	1 90
26	8,000- 9,000	8,434	301.3	83 46	63 86	38 29	45 17	98	.2729	1 77
41	7,000- 8,000	7,381	277.16	81 18	52 11	38 47	42 72	1 10	.2929	1 64
40	6,000- 7,000	6,499	239.6	73 59	43 65	37 50	36 09	1 13	.3071	1 59
39	5,000- 6,000	5,540	209.37	65 91	34 56	33 76	32 14	1 19	.3147	1 52
25	4,000- 5,000	4,605	176.0	56 61	27 20	29 58	27 02	1 23	.3216	1 48
10	Less than 4,000	3,061	117.4	57 22	4 25	36 62	20 61	1 86	.4874	93
203	Av. per cow..	6,710	248.14	$73 62	$46 80	$36 11	$37 51	$1 09	.2967	$1 64

In studying this table it will be clearly seen that, as the amount of milk per cow is increased, there is a decrease in the feed cost of producing milk per 100 pounds.

The cost of maintaining a cow per thousand pounds of live weight under similar conditions is practically the same, whether she produces a large or small amount of milk. Before any food is used for production the cow first uses enough, either of the foods she eats daily or the food which she, in times past, has stored upon her body in the form of fat or muscle, to maintain the wear on the various organs, to keep her warm, and to give her energy to move about. There is no return from the feed used for maintenance, except the life in the cow and the manure. If she only eats a small amount above her maintenance ration, whether it is due to lack of capacity or to underfeeding, there will only be a small amount of milk produced, sometimes not even enough to pay for all the food consumed. This was the case with cows producing less than four thousand pounds of milk.

In comparing the columns, "Pounds of Milk Produced" with the column "Cost of Producing 100 pounds of Milk," it will also be seen that there is a definite relation of yield to cost of production. With an increase in the amount of milk produced, there is a gradual decrease in the cost of milk production. The tabulated results of 996 cows from four different cow test associations in the state showed similar results. Although there may be single exceptions to the rule, it is safe to say that, *under average conditions, the food cost per 100 pounds of milk is decreased with an increase in the amount of milk produced.*

This does not only appear to be true under average conditions, but similar results were obtained under conditions where cows were fed probably with very little regard as to the cost of production but rather to produce as much milk as possible, without regard to cost. The table below is taken from Hoard's Dairyman, Jan. 1, 1915, and the figures are compiled from data collected in the Wisconsin Cow Competition of 1911, where a prize of $1,000 was offered to the owner of the highest producing cow in the state of Wisconsin. In the table is included 157 cows—pure bred Holstein cows.

COST OF MAKING MILK WITH COWS OF VARYING PRODUCTION.

	No. of records.	Fat %.	Cost per Cow.		Total Cost.	
			Feed.	Fixed charges.	Per 100 lbs.	Per quart.
8 Lbs.						Cents.
88,000 to 11,000	15	3.64	$76 62	$50 00	$1 25	2.73
11,001 to 12,000	13	3.51	86 65	50 00	1 18	2.57
12,001 to 13,000	14	3.52	83 08	50 00	1 06	2.31
13,001 to 14,000	29	3.40	89 41	50 00	1 03	2 25
14,001 to 15,000	17	3.46	87 93	50 00	94	2.07
15,001 to 16,000	19	3.33	94 91	50 00	93	2.03
16,001 to 17,000	17	3.28	93 51	50 00	87	1.90
17,001 to 18,000	18	3.44	97 84	50 00	85	1.85
18,001 to 21,000	15	3.45	104 18	50 00	78	1.70
Average..........14,633	157	93.43	$90 72	$50 00	$ 96	2.09

The conclusion from this table is the same as from the one comprising 203 cows of a New Hampshire Cow Test Association that *the highest producing cow produced milk the cheapest.*

It is hardly accurate to place the same overhead charges on cows producing ten thousand pounds as on cows producing 20,000 lbs. of milk. The interest on the value of the cow and the depreciation would vary with cows of different production. However, in this case, the fixed charges are placed at $50 per cow for all classes. The difference, therefore, in the cost of producing milk, represented in the table, *is the difference in the food cost of producing milk per 10 lbs. and per quart.*

Comparison of Highest and Lowest Producer in Same Herd.

Many illustrations could be given of remarkable difference in cost of production of cows in the same herd, kept under identical conditions. The records of the two cows in the same herd given below are selected because just such cases would be found on a great many farms, as neither of the two cows have an extremely high or low record.

Cow No.	Milk.	Fat.	Feed cost.	Profit.	Cost 100 lbs. milk.	Cost 1 lb. fat.	Return $1.
1................	8,410	307.3	$83 58	$65 11	$ 99	$ 27	$1 78
2................	4,845	227.3	73 83	16 44	1 52	32	1 22

Although No. 1 gave 3,565 pounds more than No. 2, it cost only $9.75 more to feed No. 1 than No. 2. No. 2 gave a profit above feed cost of $16.44, while No. 1 gave a profit of $65.11 or *four times as great.*

Cow No. 2 is not giving enough return above feed cost to pay overhead charges Still, the man who does not keep records, often assumes such a cow is profitable and he not only keeps her but often breeds her to an inferior bull and raises heifers of the same limited capacity for production and for profits.

Dairy Situation in New England.

At the present, the Boston Chamber of Commerce, the Office of Markets, United States Department of Agriculture, the State Granges, and the Extension Departments of the New England states are cooperating in making a comprehensive study of the market milk situation in New England.

The cause of this investigation is the astonishing fact that the number of cows in the New England states is continually decreasing. The number of cows in Massachusetts in 1906 was 181,818; in 1913 the number of cows in New Hampshire decreased in every county except one. Other New England states report similar conditions. The decrease in the number of cows is principally due to the fact that on the average the production of milk for market has proven unprofitable. It has proven unprofitable principally: (1) because the production of milk per cow is too low; (2) the cost of production of milk has been continually increasing; (3) and the price paid for milk has not kept up with the cost of production.

In New England the prices for dairy cows during the past ten years have increased about 70 per cent. The cow which then sold for $70 is today selling for about $120.

The cost of labor has increased, not only the actual wages paid to hired men, but also the cost of board has increased. In fact, every item entering into the cost of producing milk is considerably higher today than ten years ago. While the increases in cost of feed is about 45 per cent, the increase in price of cows 70 per cent, the increase in the price of milk to the farmer has, during the same period, only been 20 per cent.

The price paid for milk has not kept up with the cost of production because the milk contractors have been able to continually extend the territory from which they obtain the milk supply. If a milk conractor can buy milk cheaper in New Hampshire and Vermont than in Massachusetts, and he can get all he wants, he will buy his milk in New Hampshire or Vermont. A distance of from 50 to 100 miles further is of little interest to him. The dealer offers the farmer a certain price; he does not ask him whether he is getting enough for his milk to make a living. He expects the farmer to look out for himself. The farmer when changing from selling butter-fat to a creamery to selling whole milk to a milk dealer, changes his methods of farming without considering all the consequences. He finds himself without skim-milk and butter-milk. He quits raising calves and begins to buy cows to replenish his herd which means he will every year have a depreciation instead of an appreciation in his herd. He quits raising hogs and one or two hogs a year for his table. He finds that requirements regarding ice and sanitation are quite different, and more expensive. He is daily selling fertility from the farm. The price for milk which looked so much higher than the price received at the creamery often in the end proves to be less profitable. The difficulty is that it probably took several years before it really dawned on the farmer that the sale of milk was unprofitable. Some of the farmers then go out of the dairy business, others continue to drag on hoping for higher prices.

It is true that many dairy farmers in New England are not making interest on the investment in equipment, land and cows, and that many are practically getting no income from their own labor. It is also true that the number of cows have been gradually decreasing from year to year. This, however, does not necessarily mean that the dairy business is fundamentally wrong or that it is on a permanent decline in New England. It means we are in a period of transition. It means that we have reached the end of a period where it is not longer possible to make a profit selling milk from cows producing between 4000-5000 pounds of milk per year; when it is no longer possible to make a profit in the dairy business without paying attention to the principles of breeding and feeding, and without making a study of crops and rotation of crops best adapted to the dairy farm.

There is no question that the price of milk is too low, but an increase in price without making an effort to carry on the dairy business according to fundamental principles and business method will never make the dairy business permanent. We are just at the beginning of a permanent dairy industry for New England. Through the various breeders' associations, hundreds of records of the production of milk and butter fat of pure bred cows are being supervised and established by the Experiment Station as permanent history of individuals and of families of dairy cows.

The salvation of the dairy industry of New England depends upon the improvement of the dairy cattle. The profit in the dairy business should come not only from the sale of milk or other dairy products, but from the sale of cattle. The demand for good dairy cows for many years will be greatly in excess of our supply. The dairy industry is rapidly increasing in the west and in the far west. The dairy business is almost entirely undeveloped in the south. Buyers of cattle from South America, New Zealand, Australia, Japan and other countries, attracted by the high records of our best dairy cows, are coming to this country to buy dairy cows.

Many of our large cities have already extended their territory from which it is possible to draw milk as far as distances and conditions will permit and the time cannot be very far away when there will be no new territory to explore. The production of milk for market will then be a settled rather than an everchanging industry.

The food value of milk will be better known and appreciated. New uses for milk will be found and developed. The price of milk will then have a chance to adjust itself and become more nearly equal to the cost of production.

For the young man who loves animals, who will study the principles of breeding and feeding, who takes pleasure in seeing the young calf grow and who measures the possibility of the calf in terms of milk and butter-fat of its ancestry, there is great possibility, both for pleasure and profit, in dairy farming.

REPORT OF ADVANCED REGISTRY WORK.

PROF. L. S. CORBETT.

(Stenographic Report.)

It is said that more attention should be given to the advanced registry work than is being given at the present time. I have been talking with Prof. Rasmussen, as he has been doing this work in New Hampshire. He has some of the same troubles we have, but not so many. Most of our advanced registration is done through the Cow Testing Association testers. Sometimes the work is not graded just as it should be. If this work is worth doing at all, it is worth doing right. I have sometimes held up records, wondering if I cared to sign my name or not. Records are all marked up with red ink, because they have not been done correctly. If they were working for me, they would be through. A tester arrives on the place where cow testing is to be done, which is no small matter, and decides that cows shall be admitted to the registry. Advanced registry work has been of a poor order. Other associations have much to say about it; they say we must have better work. Who is heard? The breeder is the one who is heard; and he has paid his money and received nothing from it, like putting money into a dry well. I think the only thing we can do is to appreciate what some of the testers have to do.

I have a letter in my pocket that was given me by a man who is doing advanced registry work, saying that the work would be put under personal supervision. That is, supervisors would have to be sent from Portland to check up work done by a Cow Testing Association man. I do not know what we can do about this; I just want to state the facts in the case. There is no money appropriated by the State Cow Testing Association, by the breeders or anyone else, to carry on this work. At the present time the checking up of this work, etc., is taken out of the appropriation for the Department of Animal Industry. The University does not give us any money to handle this thing. The money we get to run the University of Maine on is for the additional work, and should not be spent this way. It is not right. We have tried to keep the thing going, but most of you appreciate that at the present time you are paying about all you can afford, to put your cows into the advanced registry. We will put on a tax of about $2 to cover overhead charges, but it would hurt a good many, and they would not have their cows registered. We cannot afford to send a man down into the southern part of the state to test cows at an expense of $25, until a man has a large herd. We want men to have their cows registered, but how are you going to do it? We have been doing this work, but the work is assuming big proportions, and Prof. Rasmussen is up against the same proposition.

The rules say that for some associations the bill will be sent from the supervisors to the state official, from the state official to the breeders' association, from the breeders' association to the breeder; the breeder pays the association, the association pays the state official, and the state official pays the tester. By the time all that is done about six months have elapsed, and the $25 man hung up for want of money. I have in a good many cases not followed the rules, but have sent the bills directly from the tester to the owner of the cows, who has sent me the money to pay the tester, thereby saving some of the work, but received letters from the association saying they "had not received bills, and why? It was not according to the rules." We all have our troubles; the breeders' association will probably say they are under-financed; there is no chance to get any money from them. I think we can swing the thing as it is, until the work grows into bigger proportions. I do not feel like making any definite recommendations about how this is to be done.

DR. WOODS: Why not refer this to the various organizations to be reported a year from now, to devise some ways and means?

PROF. CORBETT: That might be a good idea, and I do not want to see any more cost attached to this thing. The more the cost, the fewer the cows, and the less money. We have nearly as many cows as the State of Massachusetts, which is a pretty good thing for the State of Maine. The states of New York and Massachusetts have a flat rate of $25.

QUESTION: Do I understand that the work is not done properly?

DR. WOODS: I do not believe we people can thrash this out here, but I would refer it to the Experiment Station committee. If it is a burden of expense upon the University, that has not grown to be a very serious matter, but may become so, I move that this matter be referred to a committee of which the President of the Association is the chairman and the other members be Prof. Corbett and the Presidents of the Dairy Breeding Associations that are connected with our Association, to consider this matter and to report at the next annual convention.

PROF. CORBETT: There is 90 per cent of the reports that go through my hands that have red ink on them, which means that there are mistakes. There are doctors, good and plenty, that we would not let into the house. Is that the fault of the institution?

DR. SMITH: Isn't it understood that the institution exists for the purpose of turning out trained men?

PROF. CORBETT: We cannot take wood and make thinking machines of them.

DR. SMITH: You do not need to put them out, then.

PROF. CORBETT: No, we do not. I am not complaining about the institution, but about the advanced registry business.

DR. WOODS: Who appoints the testers?

PROF. CORBETT: The cow testing association men make out these reports and present them to these associations. At the present time I wish to say that we have no men who have taken a four years' course at the institution. We have a two years' course for men who have not had preliminary training, in which we try to do all we can and try to make practical farmers out of them. I think there is not one cow testing association except the Portland institution.

DR. SMITH: We have had men from your association, and supposed they were all right.

PROF. CORBETT: We send out what we have.

DR. SMITH: Then we cannot do anything about it, as the cow testing men insist on men from the University to do this work. In two years in our institution we can teach men to add, subtract, and read and write, and the man ought to be able to master the Babcock test in two years' time. This is an important matter, and we cannot select your men or take them.

PROF. CORBETT: I did not ask anybody to take the cow testing men; in a great many instances they have a great deal more than they can do. They work out the records of the association, besides other work. I think none of the cow testing association men care to stay long on a job if they can get something else to do. I am not going to enter into any argument with anyone, about the methods of education at the institution; it is inadvertent to the subject. I made that statement that the work was not correct, and if I was hiring men, I would be their boss.

DR. WOODS: Have there been any changes in the cow testing rules during the last three years?

ANSWER: No.

DR. WOODS: Then the association has a perfect right to say that the men shall not work. I say this because, for more than a dozen years, I handled this testing business in Maine, and unless there have been changes it is entirely in Prof. Corbett's hands to say whether these men shall work or not.

QUESTION: It seems all the men employed by this association are recommended by the head of the Department at Orono, and it seems that he ought not to recommend men unless they are acceptable to the association for whom they work.

MR. ADAMS: I think these men are competent, but have so much to do that they cannot do it thoroughly.

MR. ——: I do not know how much work a man ought to do, but it seems to me that the man employed by the Cumberland county association, who comes to my place and does the work, does not have his time half occupied, and I have 12 to 16 cows all the time. I know he is not overworked, but some of them have outside work to do, aside from the cow testing work.

DR. NESS: As I recall it, Prof. Corbett did make the remark that the men were not efficient, but in his defence, I will say that the men are not always competent. We engaged a man in our association, and ask Prof. Corbett to recommend him. We got rid of a man who made us considerable trouble and got another who was competent. The only thing we want to discuss is the question of the payment of the men. It is necessary to go through such a lot of red tape that we would like to get it straightened out.

Dr. Woods: All moneys which go to the University of Maine is apportioned to the different departments and the money which goes to the cow testing comes out of Prof. Corbett's department. It seems to me that some way might be found to short-cut this way of having the bills go through so many hands.

Question: How do they get the men? I supposed the members of the cow testing association paid the tester. It seems to me that he ought to be paid promptly. It is put up to us that the charges shall always be paid a month ahead.

Prof. Corbett: One of the things which I think has caused so much trouble with your association is, that I never see the bills at all.

Dr. Files: In one herd a man made out a check for $50 to an association and the association finally got it straightened out. I think it might be a good thing for some of you gentlemen to read the rules set forth by the different associations in regard to advanced registry. One man said he had had 12 to 16 cows on advanced registry at one time—(I make it 14). You are getting close to the limit set by the A. J. C. Club rules; they say a man cannot do good work with too many.

Prof. Corbett: I know of a couple of cow testing associations in the state who have all the cows signed up, and waiting to get a good man to do the testing. They won't have a man until they can have a good one. I think the men in Portland realize they need good men, and they are willing to pay more. I cannot put this thing up the way I want to, but Dr. Woods feels with me, because he went through it all, but the work has increased much since it was in his hands. I would like to settle Dr. Woods' motion, we have nothing definite now to talk about.

Dr. Smith: Who has the apportioning of these amounts of money to the different allotments?

Dr. Woods: It originates with the presidents.

FUTURE POSSIBILITIES OF LIVE STOCK BREEDING.

J. A. McLEAN.

Mankind has a strong inclination to speculate in futures. In things spiritual with the vast majority the primary interest concerns our future condition; in things physical, if we have not yet reached our three score and ten limit, we are generally to be found building our business or our pleasure, our castles or our baubles for the days yet to come. Too few of us stop to look carefully at the immediate present; we forget that there is no future; that today was yesterday's tomorrow; and that only out of the careful, steady, faithful, painstaking performance of the little tasks of today can any enlarged realization of yesterday's dreams come true or a higher vision of tomorrow's be had.

The future of dairying and of any other industry is absolutely dependent upon our efforts of today. Opportunity simply means that a man has met an occasion. What happens depends on the man. On every hand, in every business, at every moment of the day, the occasion presents itself. There are few opportunities because there are few men whose dreams of the future do not preclude his immediate situation; few men who realize that the quickest way for most men to move the mountain is by assiduously swinging the pick and shovel.

The future of live-stock breeding depends upon the work that is being done now. Breeders who have distorted ideals, who are unfaithful and slovenly in their practice are determining what must be faced and overcome in the future. It is certain that the live-stock industry in all its phases is permanently with us. Particularly is the business of dairy cattle and dairying to be with us so long as our people continue to use animal foods.

This is so because the dairy cow is most economical in the production of food for man. We shall for many hundreds of years continue to be flesh eaters; but more and more our beef shall be from the loins of pensioners from the dairy, and beef making shall more and more become a secondary dairy by-product. Likewise the people must have shoes and clothes. Cattle, sheep and swine are essential and will continue as an essential source of supplies.

Then, too, the United States has enjoyed in 1915 the greatest export horse trade in her history. The world needs horses; New England needs horses and yet in all these oldest states of the Union scarcely enough horses to deserve enumeration are being raised. Horse breeding in the United States for the next twenty years shall enjoy a healthy prosperity, but it must be built with an eye to the needs of the country's markets and not shaped to meet the local whims.

Furthermore, no system of farming has been devised whereby the farm lands of this or any other country may continue to be cropped to give larger yields, and to improve in physical condition and in fertility that does not incorporate some phase of live-stock production. And our farming plans are not and must not be short-term plans. Farming affords a life's occupation and that man who bears this distinctly in mind and who gives due consideration to the land to cover his lifetime and that of his sons and his sons' sons after him, is beginning to lay the foundations of a successful agriculture. For such a man live stock becomes very essential.

One of the greatest needs for our immediate and future success with all phases of stock, is a definite knowledge of the desired market type and an intimate study of our stock in relation to that type.

With dairy cows, today's type demands, within the respective breeds, size, capacity, production and beauty of contour. Few things have been more noticeable during the past six years than the value which breeders of all kinds have placed on size. In the show and at the sale sizable cows are wanted and paid for. Large cows with a large capacity for food and a marked ability to convert that food into milk mean large and profitable production. And we keep cows for the profits they bring us.

Profitable production is the first greatest essential of dairy cows. Are our cows producing much milk and profitably? Too few of them are. And too few of our dairymen know how few of their cows are profitable. With so low an average production, there must be and are a great many cows that are kept at a loss. This must be admitted and steps taken at once to get rid of these poor ones. Until we will do this, there can be small future for dairy cattle breeding. This is best done through the Cow Test Associations. They are the greatest factor for herd improvement in the United States today. The number of them in the State of Maine is a very accurate measure of the spirit of improvement in the state. The man who will undertake to separate his poor ones from his good ones is not going to have poor cows long. I give it to you as dairy cattle breeders in Maine to everlastingly work for the growth of the cow test association work.

And the second charge which I give you is of equal importance to it: Get rid of the scrub sire. The value of breeding has been amply proven. If we ever have good cattle in this country, we must breed them. The only source of better stock for all of us is through the sire at the head of the herd. An old adage calls the sire half the herd, but so far as improvement is concerned, he is the whole herd. Every breeder should have a mental picture of the sort of herd he desires to have at the end of ten years and must select the bulls used with all the elements of that picture well in mind. One should always see a bull before buying him; particularly too should one see the mother of that bull and study her well. She is the best certificate of what her son is likely to be able to transmit. She should have size, good type, and high production.

Not every pure-bred bull is worthy of reservation for future herd work. Breeders of pure-breds should not be too fearful of using the castrating knife. In all our breeding work the man with a medium-sized herd of grade cows is the man whose needs must be met. In his hands a poor bull plays havoc, creates discontent and discouragement for the sake of one's self, one's breed and one's customers; no breeder can afford to sell a bull that promises poorly.

American farmers and many American breeders have yet to learn how and how much to feed. In the making of good stock of all kinds, the last vital cross is the feed-box. Without due regard to the feeding of our stock, we can never realize on the best of breeding. In the earlier improvement of our breeds, feeding has been an important factor and it cannot be left out now. Failing of proper development due to under-feeding, many farmers possess herds of well-bred scrubs. There is a distinct period of growth and maturity; the dividing line is quite definitely drawn. In all our types the growing period is in the early stages of life and the earlier as a rule the more important. Consequently, we must feed the young things, not wastefully, but liberally—all their after-life depends upon it. After they have reached maturity we must feed if we will realize their producing capacity. Many men never learn what great cows they have bred until someone else has bought them and fed them to their capacity.

Weeding, breeding, feeding; these are the stockman's trinity for present and for future achievement, for who can say where today ends and tomorrow begins. Nor, can any man say which of these three is the greatest.

ADDRESS.

Dr. J. A. Ness, President Maine Live Stock Breeders' Association.

We are assembled here in the interest of and for the promotion of what I consider the most important branch of agriculture. Agriculture is the nation's foundation. Prosperous agriculture means more or less national prosperity Live stock farming means permanent agriculture and is the cheapest possible way of conserving soil fertility. The live stock industry in Maine, I believe, needs that promotion attendant with and the result of hustling brainy workers interested in their business.

The ever increasing population of our country is calling for consumption, everything the Maine farmer can produce through his live stock, whether it be that live stock for breeding purposes for labor, the dairy products or the many other varied lines of production. It may be said that the live stock industry needs no encouragement at the present time of high prices, and that this should be sufficient inducement to encourage the farmer to increase his business. Good prices are no doubt an incentive but will not do everything.

Through this association we can assist by getting at the breeders and encourage them to breed and raise *more* of the right kind of high class animals for market purposes. We have men in this state who have a knowledge of how to produce the best so to bring the highest price on the market in any country, but we do not have enough of them. We must get at the average breeder and encourage him to beat the average. *Tell him what he already knows,* that there is room at the top, or, in other words, *always* a good market, someone waiting for the best and those are the only ones we can afford to raise.

The West is calling for dairy stock and some one must supply the demand. We in Maine should be doing our share. Are we doing it? What are the conditions in Maine today?

No matter where you go in any part of the state the cry is, scarcity of good dairy cows, and think for a moment of the prevailing prices.

The Great West is gradually changing from the ranch to intensive farming and with it the demand for live stock, especially of the dairy breeds, and we in Maine should be in a position to supply at least a part of the demand.

We should be advertised as having live stock for breeding purposes as we had for high class driving horses in the past. The increased production of the high class dairy cow, no matter what the breed, and her products, should have the earnest consideration of this association. The production of the beef animal and her product in Maine some will question as profitable. In localities I believe it is profitable as well as localities possibly not so profitable for the dairy products; the foremost consideration would be distance from market.

The beef consuming population is increasing rapidly and the meat producing animals, I think, do not keep pace with it. One disadvantage the beef producer has in Maine is that there is so much of the lower grade of beef raised, thereby lowering the standard. Breeders' Gazette says: "That we need more meat is abundantly proved. Between 1900 and 1910 the population of the United States increased 19 per cent while the number of cattle decreased 1.8 per cent. In 1850 there were in the United States 766 cattle and 1,481 hogs per 1,000 people. In 1910, the date of the last census, there were only 665 cattle and 630 hogs per 1,000 people." Herein the producers can employ cooperation in marketing as well as producing. The sheep industry of course is not what it was years ago in Maine, but I believe a profitable one. The few breeders are doing good work. The sheep and her products are in demand and at a profit to the producer, but like all other lines, success is attained by the man adapted to the business. The hog industry no man will question. Every farmer raises more or less pork. Hogs are indispensable in connection with other live stock. They more or less thrive on what the other animals waste, especially bipeds.

The farmer located near hotels or restaurants can collect food at a minimum cost for hogs. The prices grain has been in the past few years have made expensive pork if fed on grain entirely. We are all more or less careless about the breeding of the hog, but here good breeding has an important place in the early and easy raised animal for market.

A very important and sadly neglected branch of the live stock business in Maine is that of draft horse breeding. Millions of dollars are sent West for draft horses to carry on our farm work, and it seems to me as though some of these horses could be raised at home, especially when prices are so high. Draft horse breeding can be made an incident to general farm operations. No matter whether it be dairying, beef raising or field crops, the raising of a couple of draft colts annually can be made a supplement to the principal interest on the farm and not displace that interest. Breeding mares can perform daily duties in the field and if properly cared for and eased a trifle on the work, which, by the way, is better than abused whether nursing a foal or not, well provide mostly for the nursing foal. When that colt attains the age of two and a half years he is ready for a part of the farm work and his cost of raising will figure like the farmers' time, making the sale of this colt, when sold, look almost velvet. The draft horse business needs our encouragement.

Finally, no matter what the undertaking, I would recommend cooperation wherever possible. In unity there is strength. Be it the breeding of horses, cattle, sheep, swine or poultry, the working together is of material assistance.

RAISING OF MANGELS.

A. E. HODGES, Fairfield Center.

(Stenographic Report.)

A year ago I plowed about three-quarters of an acre of land. Nothing more was done to it until last spring. As early as we could, we hauled on it 20 loads of dressing, and harrowed thoroughly. Then we sowed about 1,500 pounds of 3-8-4 fertilizer; we brought the tops of the ridges about 13 inches apart; then went over it with roller, without a man on it, so as to drill the surface down.

On May 21 I planted my seed on top of the ridges which had been made. About nine or ten days later we cultivated with the cultivator shut very narrow, so as to go between the rows; we did this successively four times, once a week, each time taking a little more dirt away from this ridge. After the third cultivation, when the beets were about two inches high, we thinned them to about four inches apart, and at the fourth cultivation we went over them again and thinned to about six inches for table beets and eight inches for mangels.

On July 25, when the tops quite well covered the ground, we went through them again, and that was the extent of the cultivation which they had. I tried for seven or eight years to raise a big crop of beets and mangels, but never succeeded before. This year I have raised a successful crop of mangels and turnips.

The cost was about as follows: Rent, $7.50; plowing, $1.50; dressing, $12; harrowing, $2; ridging and rolling, 80 cents; planting, 50 cents; cultivating, $3; thinning and weeding, three times, $18; seed, $2.40; total, $85.70. The product from the three-quarters of an acre was 840 bushels, equal to 1,120 bushels to the acre, making the cost ten cents a bushel; estimated value to feed, 20 cents. I sold 100 bushels of red beets at 60 cents per bushel which half paid for the entire crop.

We raised turnips with the same methods as a second crop after a crop of rye had been taken off, June 20. The turnips, although they were a second crop, yielded 920 bushels from about 154 square rods, at a cost of nine and one-half cents per bushel. Half of these were sold at 50 cents per bushel.

While I have a good corn silage and usually fairly good hay, I experimented with feeding mangels to my cows; giving 30 pounds of silage and 30 pounds of mangels to 40 pounds of silage, she would drop six to ten pounds of milk. Dropping the silage back to 30 pounds and adding the mangels from 50 to 60 pounds per day, a cow not too far advanced in her lactation period would gain four to seven pounds a day, and never failed to make from four or five to eight or ten. In another case, dropping the mangels she dropped about eight pounds per day; let her run a week and then added the mangels to her ration, and she went back from her former yield. It certainly pays to use the right methods in the raising of root crops.

FEEDING AND MANAGEMENT OF A DAIRY HERD.

E. C. Pope, Manchester.

I am going to talk to you principally on the individual feeding of cows, the only sort of feeding with which I am familiar. I do not advocate individual feeding for every dairyman, but it may be more or less useful to any man who can be his own feeder. It is seldom that a dairyman can hire a feeder sufficiently intelligent and interested to profit by the methods I shall outline. Still, treating his cows merely as a herd, a good feeder, in the habit of watching the milk scales, can check a sudden drop in the milk flow, due to weather or feed conditions, by giving a feed or two of second crop clover hay, or prevent a drop in summer by feeding corn meal or cottonseed meal at the beginning of a cold storm.

About 1905, the only grains we were feeding were bran, corn meal and cottonseed meal, and the rations were small at that. Our best cow gave us 7,000 pounds of milk in a year. Prof. Walter A. Conant came to us, asked for the privilege of experimenting in our herd, and offered to teach us individual feeding. My brother and I worked under his direction for about two years. The effect of good feeding is cumulative; a cow that has been poorly fed will not reach her maximum production the first year that she is well fed, but her work will be likely to improve for several years. After four or five years of individual feeding, the average yearly production of milk for our herd of Jerseys and grade Jerseys reached 7,000 pounds, and our best cows were giving 9,000 to 10,000 pounds a year.

As a general rule, you will not get marked results from increasing the ration after a cow has been in milk six weeks, gains after that time usually being slight and expensive, therefore the cow should be fed to bring her up to full flow within that time, and efforts after that should be to prevent any abnormal drop in the milk flow, for a falling-off that lasts three or four days will probably not be regained before the next calving, and will mean a serious reduction in the year's work from the cow. Our most useful feed, in restoring a cow to flow, is mangel wurzel beets. These are fed chopped, half a peck or so to a feed, repeating two or three times, if necessary. Corn meal and cottonseed meal are useful for this purpose, but have to be used with judgment, not to cause indigestion or udder troubles. Beets may be given with perfect safety except in cases involving a too relaxed condition of the bowels.

Our main dependence in grains is on bran, cottonseed meal, Diamond Gluten, corn meal and dried distillers' grains (Ajax Flakes or Fourex). For special feeding, we use ground oats, feed flour and linseed oil meal.

We build a bin with eight compartments, in the form of a carpenter's square, putting the bran in the corner compartment, which is the largest; the man who takes out the grain stands inside the angle, and all the compartments, holding a bag of grain apiece, are within easy reach, the grains most used being put in the compartments to the right of the bran. We make a list of our cows, in the order in which they stand, and opposite each name write the grain ration for that cow, expressed in letters and figures, for instance, $\mathrm{BCG}\frac{\mathrm{M\ 3F}}{4}$ means one pound each of bran, cottonseed and gluten, a half-pound of linseed oil meal, a quarter pound of corn meal and three-quarters of a pound of feed flour at a feed. The grain is measured out in dippers holding approximately a pound, double the quantity shown on the grain sheet being measured into a large dishpan, mixed, and divided equally between two milk pans—one for the evening feed and one for the morning. These pans are piled in order, from six to ten in a pile, as convenient, and, the mixing having been done at whatever time is most convenient for the feeder, at feeeding time it is only necessary to carry the piles along in front of the cows and pour in the grain. By the use of this system, the actual mixing and feeding of the grain may be delegated to a hired man, while the owner retains full oversight and direction, guided by the milk scales and the general condition of his animals. An animal that has settled down to steady work may need no change in the grain ration for weeks, but fresh cows need constant attention, and there will be need of some changes on the sheet almost daily, with occasional thorough revisions.

Bran is fed to give bulk to the ration and to supply ash and protein, though it is an expensive source of protein. We give not less than a pound a day, often two pounds, and in heavy rations, sometimes three or four pounds.

Cottonseed meal is the hardest feed to do without, but we have been obliged to find a substitute this year, and Diamond Gluten has produced very satisfactory results. We always feed some gluten for the sake of variety, though it is usually a more expensive source of protein than cottonseed, and Diamond Gluten is more economical to buy than Buffalo Gluten.

Corn meal is a very palatable feed and is useful in keeping up the condition of cows that are inclined to put all their feed into the milk pail. Hominy feed makes a good substitute for corn meal, with the added advantage that it is kiln dried, so can be stored without danger of heating, and if the price is not much higher than that of corn meal, it is more economical to buy, because of its small water content.

Dried Distillers' Grains (Ajax Flakes or Fourex) are reasonably palatable, and add variety and bulk to a ration. They are a much cheaper source of protein than bran, usually comparing fairly well in this respect with cottonseed and gluten. They are especially valuable in giving bulk and variety to a large ration, for a cow giving a big milk flow. Large rations we sometimes divide into three feeds instead of two, giving one feed at noon, but this is done only in special cases.

Ground oats are too expensive to make a part of the regular rations, but are valuable in starting fresh cows, giving bulk to heavy rations, and conditioning dry cows. The same objection of expense applies to linseed oil meal, which we use under the same conditions as ground oats. If no silage or other succulent feed is available, the laxative qualities of old process oil meal may justify its cost, and it is valuable for calves and growing heifers. It is the safest concentrate to begin on, when working a fresh cow up to full flow.

Feed flour we use principally in summer, to overcome the too laxative effect of flush pastures. We sometimes add a tablespoonful or two of Swift's Soluble Blood Flour to the ration, for the same purpose, usually in addition to the feed flour.

In winter, most of our cows are fed all the hay they will clean up promptly, but if a cow is too much inclined to put on fat, we reduce the hay feed, and by the use of laxative feeds, as silage, mangels, etc., we can often get a satisfactory flow of milk. In seeding down, we use red clover and alsike liberally, in order to have as much clover as possible in our hay. We use oats as a nurse crop in seeding down, and cut the oats, when in bloom, for hay. A heavy crop of oats is hard to cure, but the hay, when well cured, is very palatable, a good milk-producing feed, and gives variety to the rations. If allowed to mature more fully before cutting, the stalks become woody and unpalatable, and much of the grain passes through the cows, whole and undigested. We used to sow Canada peas with the oats, but the weight of the vines often lodges the oats; the mixture is harder to cure into hay than oats alone, and the pea vines proved unpalatable to many of our cows.

In summer, we feed most of the cows what hay they will eat; of course that is but a small quantity when pastures are flush. When pastures get short, in July, we begin to feed silage in addition to hay and grain, or if we have no silage, we mix about 60 pounds of dried beet pulp with six or seven quarts of feed molasses, stirred into three gallons of hot water, let stand half a day in tubs for the pulp to become saturated and softened, and feed about two quarts of the mixture to a cow, night and morning. The food value of so small an amount is ridiculously small, but it seems to be a milk stimulant, the ash probably being of value, as well as the succulence. Our cows did not take kindly to the mixture at first, but learned to like it after a few days, and soon were very eager for it. When no silage is available, we can get the same results from beet pulp and molasses.

We feed about thirty pounds of corn silage a day, to cows giving a good flow of milk and, if we can spare it, we use silage to condition dry cows and to keep the heifers growing. Second crop clover makes excellent silage. If the clover can be put in to fill the silo two-thirds full, and corn immediately cut in on top of it, the corn will jam the clover down so that there will be no waste on top; otherwise the clover lies up so light that the air gets into it, and it will spoil to the depth of a foot or more. The clover has to be put in whole with us, as we are almost sure to pick up some stones in the handling, which would smash our cutter knives. If kept level as it is put in, the clover silage comes out easily in flakes, and is less inclined to mold than corn silage. One spring, we had just begun to feed from the clover when we turned the cows to pasture, and stopped feeding silage. When we began to feed again, in July, we found that the silage had merely dried over the surface, and was all good feed, except for a moldy strip about a foot wide, around next the silo wall. If the clover cannot be put in entirely green and unwilted, it should be well wet down while filling.

Last summer we had a short crop of corn, and a big second crop of clover, so we filled two of our four silos with clover. The weather in September usually makes it difficult to cure clover for hay, and by putting it in the silo, we make sure of it. Clover roots are much more likely to winter over safely if the second crop is cut, than if it is left to mature seed, and we are anxious to secure all the clover hay possible.

We have tried oats and peas, barnyard millet, and green corn as soiling crops, to supplement short pastures, but the cutting and hauling of the crop breaks up the day's work for a team, the green stuff heats and spoils if left piled in the barn, and silage will give the same results at less labor cost.

Mangels are of great value to us, not only as a feed, but also as a medicine. When we see the first signs of garget, we take away all grain and silage, feed only hay and chopped mangels, and massage the affected quarter of the udder. This treatment will generally effect a cure, if given early, and avoid the drop in the milk flow that usually follows dosing with Epsom salts or saltpetre. We use beets as a special feed in addition to ensilage, to check a dropping off in the milk flow, or to stimulate the flow of a fresh cow. If a cow goes off her feed, we can take away all grain and silage, and give mangels until her appetite returns. If the cow off feed will not take beets, we try apples, sometimes sweet, but sour apples are more appetizing. Sour apples are safe feed if not given in excessive quantity; half a peck at a feed is plenty to start with.

We have tried many varieties of mangels. Most of the seed on the market is very ragged as to type. I have never tried a sample of Golden Tankard that did not produce half a dozen or more distinct types. Giant Yellow Eckendorf seed comes very true to type, and gives us heavy yields of large, smooth beets, that are very easy to pull.

An important point in the management of the herd is getting the cows into good physical condition before calving. You cannot expect a cow, that is in a run-down condition when she freshens, to produce heavily, and any cow of good dairy temperament will be greatly aided by having a considerable surplus of flesh to draw upon while in full milk. A cow that is strongly inclined to put on fat is another story.

There was a time when it was considered unsafe to get a cow into the pink of condition before calving, because of the danger of milk fever, but now the air treatment has made that a disease little to be dreaded. We have several cases each year, but have never lost a cow from it, and the cows usually make a quick recovery, with no apparent decrease in the following year's work. As we are now familiar with the symptoms, we can sometimes give the air treatment before the cow goes down, making it a preventive agent instead of a curative. We plan to give each cow a drench of a pound of Epsom salts, an ounce of saltpetre and two ounces of ginger, a few hours before calving. After calving, we give a warm slop, of about a pound of bran and half a handful of common salt, scalded by pouring hot water on it, allowing to stand a few minutes, and then filling the pail with water, making the temperature about as high as the hand will bear with comfort. This is followed by all the blood-warm water the cow will drink and plenty of good hay. After two days we begin the grain feeding by giving a little bran, gradually adding ground oats, Ajax, feed flour, oil meal, and after six or seven days, beginning with the heavier concentrates, taking three or four weeks to get upon full rations. Our general rule is to feed about one pound of grain to three pounds of milk produced, in winter, and one to four in summer, but we vary this widely with individual cows. If our pastures were adequate, we might feed considerably less grain in early summer.

In conditioning dry cows, we almost always feed some bran, corn meal if the cow is pretty thin, and oil meal, ground oats and Ajax Flakes as conditions demand. We do not feed corn meal within two weeks of calving, nor when the cow shows any tendency to udder troubles. Usually we also give a small feed of silage, or sometimes a few beets; laxative feed of some kind is important during the conditioning period.

We do not like to buy a cow that has been in milk more than six weeks, as such a cow will not respond readily to our feeding, and we do not expect a cow to do her best work the first year we own her, in any case. Often cows that do only ordinary work the first year, will reach 7,000, 8,000 or 9,000 pounds of milk after two or three years of our feeding.

It makes quite a difference what time of year your cows calve. Our business demands that we have cows freshening all the year 'round, but we do not expect big work from cows calving in July, August and September. It is very difficult to get a good start when the weather is hot, the feed short in the pastures, and the flies troublesome, and if you do not get a good flow at the start, you will get a poor year's work. Even May and June are rather unfavorable months, for in spite of a big flow at the start, summer conditions give an early dropping off that can never be regained. November to February is the most favorable time for freshening, as the cows then do their heaviest work while conditions are most under the control of the herdsman, and as the flow slackens with advanced lactation, it is stimulated by the flush pastures of May and June, and the summer drop occurs so late in the lactation period, that the effect on the year's work is not very serious.

If you are raising calves, feeding should be considered several months before calving that the cow may be in condition to drop a vigorous, well-developed calf, and then the calf should be kept growing, but there is perhaps as much danger in overfeeding the calf as in underfeeding. In the matter of summer treatment, we have tried several methods, but are now keeping the calves in the barn, up to three months of age, at least, as they require less attention then, and the flies bother them less. After that age, we often keep them in grass paddocks near the buildings, give skim milk and a little hay twice a day, water once a day, and spray them to keep off the flies. We have sometimes tethered calves on grass, near the buildings, and they have made remarkably rapid growth, but it is an expensive way to care for them: they must be watered, kept out of the sun on hot days, and moved frequently upon fresh feed. It might pay to handle a few first-class ones in this way. Calves five or six months old may safely be turned out to pasture, but must be watched lest they run down from the pasture's getting short. It does not pay to keep them out late in the fall to save hay, for, once they get stunted, it is next to impossible to get them back into good growing condition again.

We are short of hay this winter, and are feeding our yearlings on oat straw with a considerable growth of witchgrass in it, and by supplementing this with grain and silage, we are getting a first-class growth on the heifers, and they are eating the straw pretty clean. Straw alone is mighty poor feed, but we have never had a bunch of heifers do better on any feed, than these have done on this combination.

We begin to feed grain to calves by the time they are two months old; a mixture of bran, ground oats, oil meal, corn meal and feed flour, with the addition of Ajax and gluten when they get to five or six months, dropping out the expensive oil meal and ground oats. In winter, the calves will take silage to advantage when they get to be six or eight weeks old. Keep your calves growing, but do not on any account let them get fat. The better the calf, and the more highly you prize it, the greater the danger of overfeeding.

I want to endorse the talk that Dr. Pearl gave you the other day, advising against the use of young and untried sires for a dairy herd, or buying a new bull every two or three years. The only criterion to a bull's value as a breeder is the performance of his daughters, and you can know little about that until they reach three or four years of age. While I would not raise a bull from a poor dam, good performance of the dam is no guarantee of performance in her offspring. A few years ago, we bought a cow that would give us 8,000 to 10,000 pounds of five per cent milk a year, an ideal cow for business, and a good looker. We raised three of her heifer calves, and not one of them would give milk enough to pay for barn-room.

We have been watching progeny for five or six years, and have one bull that we know is good, and another, about three years old, of our own raising, that we are getting a line on, and a bull calf from our best cow to follow along, so that we hope we shall never again be obliged to depend on an untried bull. This method is rather expensive, and a man must be doing quite a business to be able to afford to keep the two or three bulls needed in order to have a tested bull always available, and must be raising a considerable number of calves in order to get a line on his bulls. Sometimes it might be possible to buy a tested bull, that the owner would sell to avoid inbreeding, but the man who is really afraid of inbreeding will usually turn off his bull before he knows anything about him, and then gamble on another untried youngster, so you would be no better off by buying such a bull, unless you have an opportunity to learn from the owner's records, within a year or two, the performance of the bull's daughters, thus saving a year or two that would be lost if you bought a young bull to test out for yourself. It is not advisable to buy an aged bull to test, because his age will put an end to his usefulness too soon after you have proved him.

QUESTION: What is your own idea about inbreeding?

ANSWER: I do not consider inbreeding as inbreeding of any value whatever, but if a man has judgment and inbreeds vigorous stock, he can perpetuate a strong family. If you breed out all the time, you will dissipate what good blood you have. If you have healthy animals I do not consider it is dangerous. You cannot do anything without judgment, whether you are breeding in or out.

QUESTION: How long do you feed skim-milk to your calves?

ANSWER: It depends on how much we have available; sometimes to six to eight months old, sometimes to a year old. Sometimes we have fed it to the milking cows. It is good feed. If you have milk to spare you can substitute it for part of your grain, at least. We can get three one-half cents per gallon for our skim-milk, and then the grain would be cheaper.

QUESTION: Do you think it would be possible to raise good calves without milk?

ANSWER: I never tried it, and I would not want to try it.

QUESTION: What is the cost of your basic ration?

ANSWER: We don't have any. Every cow gets a different ration. We go to the individual cow to see what she needs. Some cows won't take all kinds of feed, and will not give good results on certain feeds, so we make out a ration of bran, cottonseed, gluten and corn meal, and frequently it will be somewhere near equal parts, but we try to keep the cows in uniform condition. Some cows will put everything into the pail and some will put the feed all on their backs.

DR. WOODS: When you say equal parts, you mean equal weights?

ANSWER: Yes.

QUESTION: How long do you have your cows go dry?

ANSWER: If a cow is a persistent milker, we try to dry her off about six weeks to two months before calving. Some will go off, anyway. It depends on the condition of the cow; if she needs a good rest we give it, and if not, we milk her longer; if she is in good physical conditon, sometimes she will milk clear up, but the calf will not be so good.

QUESTION: What do you think of the feed value of the mixed feed, as they call it.

ANSWER: We prefer the coarse bran; we do not consider mixed feed a good feed for general use. We prefer to buy the ingredients separate.

QUESTION: What do you think of the prepared feeds? They sell more of that here than anything else. Most of the farmers here use it. It is $1.50 per hundred pounds.

ANSWER: I think much of that is mill sweepings; most of those feeds are simply a means of getting $1.50 per hundred for oat hulls. They price it on the same scale as the other feeds. It is offal from the breakfast food houses. It is good feed for the man who makes it.

QUESTION: How many times a day would you feed hay to a cow?

ANSWER: Twice is just as good as more, and cheaper. If you begin in the fall, two feeds are just as good as three. We feed ensilage twice a day, too, after milking. They will eat the ensilage first, in almost every case.

QUESTION: Would there be any harm in giving the hay just before milking?

ANSWER: The air would be full of hay dust, and we do not want that in the milk.

QUESTION: You cannot feed too much hay if you feed just what they will clean up? Is that the idea?

ANSWER: There might be cases where a cow puts on too much flesh.

QUESTION: You do not think feeding hay once a day enough?

ANSWER: Why, if you are short of hay, that might do. A man told me he fed two bushels of ensilage and hay once a day. Then they get the roughage in the ensilage.

QUESTION: Do you think it would be better to feed more grain? We are feeding about one peck a day.

ANSWER: Grain by measure is rather unsatisfactory, because if you are feeding the same to all your cows, you may know what to feed them, but when we feed individually, it would not work.

QUESTION: Do you carry that grain ration through uniformly, or is there a point in the production of a cow, at the maximum point, when you switch off and give just enough for physical condition without regard to milk production?

ANSWER: No, we watch the individual cow, to see what she is doing, and give just enough to keep her in good condition. We make changes very gradually; we do not make any quick changes. After a cow has been fresh a day or two, we start in on a little bran; then we add half a pound of ground oats, then we add some Ajax or a little linseed oil meal, but we come up very slowly, and do not give much in the line of concentrates until the cow gets well started. Linseed oil meal is the safest concentrate to start with.

DR. WOODS: I think you did not make it perfectly plain that you work out your feed according to your milk sheet.

ANSWER: Yes, we watch that sheet, and the cow's condition; sometimes the ration goes on for a month without changing, but if the cow begins to drop, we take means of bringing her back to flow. In summer we cannot give much extra, except perhaps a little grain feed.

QUESTION: Just how much would a cow drop off, before you changed the feed.

ANSWER: If she has been running very uniformly, she might drop two or three pounds without changing, but if she drops considerably, we change the ration. We add each week's work of each cow, put on the milk sheet the average for that past week, and then compare the last two milkings with that average and it gives us a fairly good index of how she is running. We also put on the amount of the drop, as compared with the week past. As to how much is a serious drop, would depend entirely upon the cow, and you would have to depend on the judgment of the feeder. The chances are small of your hiring a man who has judgment enough to do this sort of feeding.

QUESTION: Is there a difference in the grade of brans? How are we to know which are high grade?

ANSWER: You have an Experiment Station to find out for you.

QUESTION: What is the Ajax feed?

ANSWER: Dried distillers' grains, good feed, very valuable. To a cow giving a good flow of milk, you can feed three or four pounds per day. It is more concentrated than bran; that is, it carries more protein. You can get protein in this form cheaper than you can in bran. If you have a cow giving a large amount of milk, bran and Ajax will give you variety and bulk and protein. We give grain in two or three feedings per day, three feeds only in case of a very heavy ration, for a cow giving a large flow.

DISCUSSION, THE SAME OLD STORY.

Opened by E. L. BRADFORD, Auburn.

(Stenographic Report.)

They asked me what I would talk about, and I said, "The same old story, I guess." So they put it down. Afterwards the Commissioner asked me to talk about the railroad rates, and I understood that I was to be let off on this part of the program. However, there are a few things I want a little advice on, in return for some of the advice given you so freely the past year. There are two matters; I have not been here every day, and if I bring up anything that has been all worked over, you need not tackle it again, but if it is new, I wish you would discuss it.

One thing will be the tuberculin test. Something we have paid a good many thousands of dollars to farmers for in the last five or six years, to recompense them for many thousands they had paid out to have their cows tuberculin tested. I confess that my idea originally was that it would enhance the value of our product, and I have not paid very much attention to the farmers' end of this thing; I have worked almost exclusively to get as much money for the product as I could—I ought to say the Association has done some work in this way—and allow the farmer as much as we could afford to after expenses were paid. I have not studied feed problems nor breeding problems, or anything of the sort; I have had more than I could do with efficiency to get the best results, the most money for our product. My idea probably was, originally, that we would be in enough better standing, or our product would, to recommend it to the consumer, so it would pay what we have paid to the farmer. That was not the proper method, considering how much we have heard the last few days about pasteurizing milk; it does not seem to make much difference whether there are tuberculosis germs in it or not, or other bacteria, as they are all killed in the pasteurization process. Now, I do not see many of our patrons; perhaps I ought to go around the country more and exchange views. A great deal of business has to be done, and I cannot do it very fast; about the only way I can do it is to sit down and plug. Some have said to me, "I do not believe in testing; I would not have my herd tested, I do not believe in having that poison injected into them." I do not believe they are right; I think the men are right who have their herds tested, and if any tuberculosis is found, they get rid of it. I am wondering if, from a market standpoint, it really pays; whether it is right to take the money away from the fellow who does not want his herds tested, to pay for the man who does? Is it right for us to take A, B, C and D's money to pay for having E's cows tested? Mind you, we do not claim for a moment that you are taking any of my money for having the cows tested, it comes out of the man from whom the money is collected. Please discuss this.

Another question is, How much does this affect good product put into cans and kept clean and cold? Now these words have been used enough so that it is fair to call it "The Same Old Story." Years ago I undertook to read a short paper over in Auburn, and all there was to it was to ask the farmer to recommend methods of producing milk and cream to keep it clean and keep it cold. These two words tell all there is to be said from a market point of view. I do not tackle the feed and breed questions at all. Now there is a vast amount of expense in owning and keeping up farms, keeping stock, taking chances on cows dying, and you have to feed, pasture and milk, and all that sort of thing. If, by adding a little care, just wiping the cow's udder and grooming her—it does seem as though a herd of cows ought to be kept groomed same as a horse—after all this expense and labor and risk for producing milk, just get a point further. It costs so little to do these things. Keep the cow's blanket clean and wipe the udder dry. Why can't we use a narrow top milking pail? I do not believe one in a hundred patrons use the narrow top pail. Some do, and I believe that, with careful, persistent practice, you can learn to milk in that all right, and I believe they will do a great deal of good. In fact, one man suggested lately that he liked to use them, because when he did not the milk spattered all over him.

In the matter of ice, some use it, some do not. By no means could a man consume more than five cents' worth of ice to each hundred weight of milk. That is very little addition to the cost, and this is the time of year to prepare for ice. Dr. North told us about grading milk in New York City, A, B and C grades, and then he or someone else said, "You have got to test your milk before you get to grading it." This means increased cost, and then you want more price. That is the right spirit; you should produce the milk first, and then insist on the price. So many good people have been taking pains to have their milk clean, and then it has been mixed in with others' that is not so good. I suppose I ought to be more careful about it. I have thought of this for a number of years. We have over four hundred farmers and over fifty towns where the milk comes from, and I would like to know whether Farmer A does this thing better than Farmer B; suppose we should have a card system, and pay A more than B. It means a lot of work to keep these cards and get them right. Suppose these cards were not right, then the fellow that was getting the lower price might say: "Look here, doesn't everybody around here know, that my cows, my barn and my products are just as good as the other fellow's, and they are paying him more?" If I know I am right I can stand a good deal of punishing, but when I don't know, I am afraid. I think that is a poor policy for our not having made a distinction between the milk that is sent in. I could not set any hard-and-fast rule that would not be troublesome. If I could get a certificate from the veterinary who says that a man is authorized to do testing in this state, and I get Dr. Ness' or someone's certificate, from some authorized inspectors, why, then I can give that fellow more, but this other matter is a difficult one. I want to hear a discussion from other creamery men in relation to these questions, and any others they may wish to inject, and I want to hear from some farmers. No farmer can speak too frankly and plainly for me, as long as he tells the truth. Ever since I was a young fellow, a good while ago, I would say about a proposition, "What is right about that?" And that is all I want to know, if I am the only fellow on that side. I know that so well, that it does not phase me to have somebody tell me that I am not right. I am not on my side, I am on the side of right. That may sound egotistical and boastful, but that is my position.

Another question. Should we continue this tuberculin test business? I have talked with a good many people who have had their cows tested, and I believe this is the right thing to do. It is not profitable to try to raise milk from a herd that is diseased. Healthy animals are more profitable to keep. Is it wise for an association to use one farmer's money to pay for having another farmer's herd tested? The tested herd business is not on the increase. It did increase for the first two years, but is not increasing now. I believe in the long run it counts. We have some of the finest trade in Boston using our milk, and if we had poor milk they might drop ours and get somebody's they liked better, and perhaps we would not know the reason, but can't you see, yourselves, that if you have good stuff, you would have good possibilities for profit if we had enforced testing.

QUESTON: Do you think that the tested herds increase the price of milk? Do we get any benefit from what are tested?

ANSWER: I tried to make it clear that I thought it would. Several years ago a man from Boston asked me why we pasteurized our milk. Now the same man wants our milk pasteurized. There is no rule for it in the city of Boston, but it has become generally accredited, and it is said to make milk entirely safe so far as contracting tuberculosis from cows by humankind is concerned.

MR. HOLSTON: I understand they have invented a new machine; a clarifier or dirt tester. Do you use that?

MR. BRADFORD: We take samples of farmers' milk and put it through a little bit of cotton, sometimes dry it out and mail it to them, and we have a contrivance if it does not run through fast enough, a little copper affair so we can put samples through faster than they would go through. A little pad of cotton through which the milk passes, and takes out the dirt. I think we have used what you are talking about. We have had just as good a thing before, but it took longer to put the milk through. Dirt and bacteria go together, so if the milk is not kept cold, by the time the milk reaches the creamery the bacteria would not be an absolute test of purity, because one man might use ice, and the other one not, and the milk might change before it reached the creamery. If milk is all the same age, and kept at the same temperature, I do not see why that milk should materially differ.

QUESTION: Well, won't the clean man use ice, anyway?

MR. BRADFORD: No, not always; some keep their milk in cold springs. In regard to this, do not think that if milk is set into water that does not come to the top of the can that you will get good results; the can should be set down into the water, so that the milk will be uniformly cooled.

MR. ——: I am milking nineteen cows and selling my milk. In the rush of summer I buy considerable milk from the Turner Center Creamery, and I am interested in this discussion. It seems to me that the creamery might demand a certificate from the Board of Health that the barn is clean and sanitary, and that a man keeps ice, and it seems to me that a man who had one of these certificates could get a higher price for his milk. It seems as though it might be arranged so that the man who is not sending any clean milk would get enough less for his milk so that the man who gets a higher price could afford to pay for the inspection.

MR. BRADFORD: I am glad to hear that; I am drinking it in like a sponge.

QUESTION: I would like to inquire how many here are putting milk into the Turner Center Creamery? I think, if Mr. Bradford would come to East Sumner and make a talk like this, there would be a different feeling about the creamery than there is today. I think if the people would get together on this, they could get a better price. For ten years we have tested our cows every year, and we fail to see the slightest signs of disease. Ten years ago we had two animals we bought in Massachusetts that we lost, and ever since, we have had our cows tested every year.

MR. HOLSTON: Would it bring in more money to the farmer if he was fitted up to pasteurize his own milk on the farm?

MR. BRADFORD: I believe it would cost a good deal more for the farmer to do it himself. We can pasteurize a carload of milk in a little over an hour, at a rough guess—a carload of over 20,000 pounds. Put it right through; and then again it has been quite a job with us to train the best men we have to do that thing in the fashion that is called right. I should think that not one farmer in ten would handle it right for quite a long time. I think this is not a practical thing to do. If you would be cleanly in your methods of producing milk, put it into the can and set it into ice water, summer or winter—that is the only place to set milk, because it takes milk so long to cool in air—and then ship it to your creamery, *clean* and *cold.* Just remember those two words, and it will get there in good condition; the creamery will do the rest much better and cheaper than you can do it yourselves.

QUESTION: How much would it cost extra?

ANSWER: We will assume that the man keeps the cows' blankets and udders clean. How much does it cost per hundred to keep a cow groomed and clean and to wipe the udder before commencing to milk? I know about the ice; you cannot use more than five cents per hundred weight of milk. How much does it cost, in addition to the milking and the risk, feeding and maintenance on the farm, etc., to just wipe the cows' udders and use the narrow top pail?

MR. JONES: It would take five to seven minutes per day, per cow, to keep her properly cleaned.

MR. HOLSTON: A minimum of five minutes.

MR. BRADFORD: How much is it fair to reckon per hour? That depends upon the stable conditions, how much time it would take. Supposing we say ten cows per hour. How much would it cost for your hired man to do it?

MR. HOLSTON: We do not want hired men to do it, if we can help it.

MR. BRADFORD: Is 30 cents per day for ten cows a fair estimate?

ANSWER: Too high.

MR. BRADFORD: It depends on how well you groom her. If you groom the cows to take the dust out of them, it would take longer.

MR. HOLSTON: I think two cents per cow would be a fair figure. That would be about ten cents per hundred weight, and five cents for ice. That does not leave much.

MR. BRADFORD: You get 60, 55, and 50 cents per hundred, the lowest, 30, 25, and 20 cents. The bottom price is where the item of extra expense to get the milk on the main line comes in. The price of butter-fat is just the same to all the patrons of our creamery and the price of milk depends on where they are located. When we started, more than thirty years ago, at Turner Center, we were going to hire a collector to go up, across, down, and back to the creamery. One man said, "It is not more than a quarter of a mile to my house; must I share equally with all these other fellows?" The president said, "Why, yes; it costs more to get your cream, because the man has to harness his horse to get it, and then it does not cost much to go to the next man, etc." Probably the business we are doing can be financed and operated and carried on—we will assume that it could—more profitably than a small business, so that you who live close to the creamery are purposing to cooperate, by dividing with the others who live farther away. You get a little benefit from their product. Let us suppose that two or three farmers come down from Buckfield, Sumner, etc., and went to one of the store keepers here to sell his product, he would have to travel around quite a little, and then they would turn him off, because others were coming. How easy it is now; you do not start out with a box of butter to see how much you can get for it. Everyone is used alike in the factory. It is all right, too. Are not we accomplishing, directly, what you are looking for and longing for—the farmer to make his own price? You do not expect any individual to make his own price, but hire someone to sell the product and he make the price. I feel that it is all right to give the fellow at a distance all that you can; it is good to bring him in with the rest.

QUESTION: How much have you averaged, the past year, paying for milk?

ANSWER: Wasn't it 40 cents per hundred weight for 1914? I want it understood that the hundred weight takes in the butter-fat again; that we are paying a certain number of cents for butter-fat, and the price of milk, say 50 cents, at the present time, you are getting butter-fat added to the price per hundred weight. Why do we do that? Why do we not separate the butter-fat from the skim-milk? It is too much work, and would not pay.

QUESTION: I think you have your average for the year very high. Now you are paying us high, but in summer the pay is low. What are you getting for skim-milk now?

ANSWER: You have touched us on one weak point. I put out a notice some time ago that we would sell skim-milk to the farmers at five cents less per ten gallon can than what we paid him for a hundred pounds. If you were delivering at the Auburn creamery at the present time, we would pay you 60 cents per hundred weight, and if we followed that rule that I get out to all of our creameries everywhere, we should be charging you 55 cents per can for skim-milk, but the farmers have turned in milk so much faster than we could get the trade for it, the lowest price to the farmer now would be 50 cents per can. They would not pay that, and we could not sell it in the milk, and what could we do? Shall I stick to what I have said, or shall I back down and meet the conditions and sell that milk for something? As a matter of fact, in just that one particular point we are not getting the same from all farmers. That does not sound very good. Here is a creamery over in the country somewhere, six or eight miles from a railroad station; the demand is big; we do not need the milk from that creamery; we do not need to tell the patrons they must change over, but we do not need to cart that milk to the station, ship it to Auburn, and then be unable to sell it and have to make casein of it. The creameries write in and say, "The farmers won't pay your price." What shall we do? I tell them to sell for what they can get. That is one weak spot; find another if you can. I have confessed to this one.

MR. ADAMS: "Confession is good for the soul."

QUESTION: One question I wish to ask, of the private dairyman, of the man who does not get anything from his skim-milk. Just how many cents per quart would you value it for feeding purposes?

ANSWER: I think a price cannot be set on skim-milk. I believe one man made a statement that he would not take a dollar per hundred for his skim-milk. Therefore, the value of skim-milk depends on what you are using it for.

QUESTION: Is 50 cents a fair value?

ANSWER: It is too much.

ANSWER: Depends on what you feed it to. It is worth about 25 cents per hundred to calves, about 50 cents to feed to hens.

ANSWER: It seems to me that it is worth more than 25 cents; it ought to be worth 35 cents.

MR. BRADFORD: The question in regard to keeping the herd clean. Why does a farmer blanket his horse? I should like to have someone answer that question.

ANSWER: To keep him warm and make his hair lay down; to keep him clean.

ANSWER: Some one asked why we dress up when we have our pictures taken? Because someone else is going to look at it, and we blanket our horses for that reason. Why not blanket a cow? If you blanket a horse to keep him comfortable, and wear clothes to keep warm, why not blanket a cow? I think a man with sore hands, without warm water in his barn, will not like to wash the cows' udder in the morning. Why doesn't someone invent something to keep the cow's udder clean during the night? Why do you take a bath? Then groom the horse to keep it clean.

MR. HARRIS: If I were going to write a book, and the name of that book was "The Same Old Story," it would have three chapters, and one would be "Business Achievement." There is not a man here who does not want to achieve something. In business, the first thing is money to achieve a good home. The second chapter would be "Cooperation." We have to cooperate more than ever before, from the creamery point of view for its patrons, or the market man for his customers. They must realize what the creamery demands or the market demands, or the consumer demands. They must realize that, and set themselves to meet that demand, and it is coming. There is not any question about it. I was somewhat taken back by the statement of the fellow from Connecticut, that he thought pasteurization had been going on from two to three years. He ought to know that it has been for fifteen.

MR. BRADFORD: I watched that argument; he stated that the states had come to require it in that length of time. I believe we should cooperate in state work, to lead our state up to a standard.

MR. HARRIS: The last chapter would be "State Relations." Agricultural possibilities of the state, harmony with all concerned, with our officers who are in charge. There must be harmony, or we are working to disadvantage, and I believe if we have these we will be leaders in this industry. Then the *Addenda*. I approach the press, and I would say to them, "Why do you put in great big letters, if someone gets out here and does a sneaking mean thing; you would put that away up, and everybody sees it, and if somebody does something noble, you just put in a notice of it." If the editors of papers would approach young men and say, "Write up something, so that I can put it into the paper," because few men could hear him talk; but there may be others who ought to know these things, and, if it is written up and put into the paper, many who are interested may see it. I know some reporters tell the paper what the patrons are doing, and they are anxious to read every part of the paper. In things along that line, I think the press could help the people wonderfully. I do not like to see the wrong thing held up, and the right thing given a passing notice.

MR. BATEMAN: I quite fully agree with the remarks the gentleman has made. I am going to say something I have not said in the press. First, the remarks of Mr. Pope will be known all over the state. Second, he has said that we should print all the things that have been said. Three weeks ago I wrote to all the speakers of his conference. Only two of them responded; the man from Connecticut, after giving his paper, asked if I wanted his paper; I told him my paper would go to press in two hours and that it would be impossible to set it up in that time. He said he did not care whether I printed it or not, and I did not. It is the duty of these gentlemen who come from away to send their papers in advance to the press, so that we could print them. How are we going to print them when it is time to go to press? You have these meetings, and talk to about thirty people. We could send it out to about one hundred thousand people. Your organizations are to blame for this; you should see to it that the papers have these speeches in advance. Give us a fair show, and we will be glad to print your matter.

MR. HARRIS: The gentleman has misunderstood me. I did not intend to criticise the papers, but rather ourselves.

MR. HAMLIN: Since I heard these speakers I feel so small that I feel that I cannot say anything. I want to confine myself to the discussion that my friend put up, that of the tuberculin test and cleanliness of the milk and cream. Way back up there in the woods, where we live, we do not hear anything about this tuberculin trouble. I have been interested in this business for 25 or 26 years, and I have eaten our butter all the time and used the butter-milk, and I am still alive, and in all that time I never had a customer who inquired whether there were tuberculosis germs in the product or not. Nobody has ever asked me, or said they would give more for tested product. All they want is the flavor of the butter, what they can taste in it. We never get any more for tuberculin tested cows, and so we do not have them tested. The matter of clean milk and cream is what interests us, and is our great trouble, but we do not claim to have much trouble here. We don't know how to adjust this thing practically and rightly, so that all will get their due; that is the great problem that is before us. Of course the dairy-men or creamery men have made a difference in price of three cents, whether cream will make good butter or not, and we have tried to follow up that ourselves, and so far as we know, that is the best we can do. The point is to get our cream and milk clean and sweet, and it seems to me most important that the creamery man gets his milk sweet. Butter making is more of a science than it was when we began, and now we have butter colors to put into the butter that we could not get in any other way. We make the flavor and it is absolutely important that the creamery man have sweet milk to put it in. The means of having plenty of ice and keeping the product clean, is a matter of greatest importance to us.

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 Society	B. J. Libby	Oakland	J. L. Lowell	Auburn	T. F. Callahan	Lewiston.
Eastern Maine Fair Association	A. S. Field	60 Court Street, Bangor.	Sarah P. Emery	24 Forest Avenue, Bangor.	Albert S. Field	60 Court Street, Bangor.
Central Maine Fair Company	S. E. Whitcomb	Waterville	R. M. Gilmore	Waterville	F. D. Robinson	Waterville.
Maine State Pomological Society	G. A. Yeaton	Norway	E. L. White	Bowdoinham	T. E. Chase	Buckfield.
Maine State Poultry Association	George P. Coffin	Freeport	A. L. Merrill	Auburn	W. Edward Scott	Portland.
Androscoggin, Greene Town Fair Association	E. B. Sanderson	Greene, R. F. D. 2	W. L. Mower	Greene, R. F. D. 1	B. P. Rackley	Greene, R. F. D. 1
Aroostook, Northern Maine Fair Association	J. Frank Guiou	Presque Isle	Ernest T. McGlauflin	Presque Isle	John E. Bishop	Presque Isle.
Aroostook, Houlton	Nathaniel Tompkins	Houlton	F. N. Vose	Houlton	Aaron A. Putnam	Houlton.
Aroostook, Caribou Trotting Park and Fair Association	Frank Riley	Caribou	Russell R. Ryder	Caribou	John Clark	Caribou.
Cumberland County	Chas. W. Chaplin	Gorham	H. William Smith	Gorham	Harry C. Palmer	Gorham.
Cumberland Farmers' Club	A. W. Stanley	Cumberland Ctr.	Willard Wilson	Cumberland Ctr.	Willard Wilson	Cumberland Ctr.
Cumberland, New Gloucester and Danville	F. H. Gray	New Gloucester	J. P. Witham	New Gloucester	George C. Jordan	Upper Gloucester
Cumberland, Freeport Poultry Association	A. Q. Carter	Freeport	George P. Coffin	Freeport	L. E. Curtis	Freeport.
Cumberland, Little Rigby Park	Sumner O. Hancock	Casco	Ernest U. Archibald	West Poland	Leland H. Poore	Webb's Mills.
Cumberland, Bridgton Agricultural Society	George E. Tarbox	Harrison	H. W. Jones	Bridgton	J. T. Bardsley	Bridgton.
Franklin County	Frank N. Blanchard	Farmington, R. F. D.	George D. Clark	Farmington	C. H. Pierce	Farmington.
Franklin, North	A. D. Graffam	Phillips	J. I. Harnden	Phillips	A. E. Bunnell	Phillips.
Hancock County	F. P. Merrill	Bluehill	N. L. Grindell	South Penobscot	M. R. Hinckley	Bluehill.
Hancock, Eden	Charles L. Shand	Bar Harbor	Julien Emery	Salisbury Cove	C. F. King	Eden.
Hancock, North Ellsworth Farmers' Club	John McNamara	Ellsworth	Inez Smith	Ellsworth	George L. DeWitt	Ellsworth.
Kennebec, South	C. F. Donnell	Week's Mills	Arthur N. Douglass	Gardiner	Jasper S. Gray	Windsorville.
Knox, North	E. E. Thurston	Union	H. L. Grinnell	Union	George C. Hawes	Union.
Lincoln County	Leslie Boynton	Jefferson	J. A. Perkins	Nobleboro	H. E. Winslow	Damariscotta.
Lincoln, Bristol	E. P. Richards	Round Pond	J. Wilbur Hunter	Damariscotta	Chas. B. Woodward	Damariscotta.
Oxford County	W. J. Wheeler	South Paris	W. O. Frothingham	South Paris	W. O. Frothingham	South Paris.
Oxford, West	E. C. Buzzell	Fryeburg	B. Walker McKeen	Fryeburg	A. D. Merrill	Fryeburg.
Oxford, Androscoggin Valley	J. M. Johnson	Lewiston	O. M. Richardson	Canton	G. L. Wadlin	Canton.
Oxford, North	Young A. Thurston	Andover	John F. Talbot	Andover	R. A. Grover	Andover.

Oxford, Western Maine Poultry Association	A. E. Shurtleff	South Paris	E. P. Crockett	South Paris	D. H. Bean	South Paris.
Penobscot, West	E. M. Atkins	Dexter, R. F. D. 3.	E. E. Colbath	Dexter, R. F. D. 3	F. C. Barker	Exeter.
Penobscot, North	H. B. Lewis	Springfield	I. R. Averill	Prentiss	O. A. McKinney	Springfield.
Penobscot, Orrington	Chas. H. Chapman	South Brewer, R. F. D. 1.	F. Elmer King	South Brewer, R. F. D. 1.	F. Elmer King	South Brewer, R. F. D. 1.
Penobscot, Bangor Poultry Ass'n	J. P. Webster	Bangor	C. S. Winch	Bangor	C. S. Winch	Bangor.
Piscataquis County	C. W. Hayes	Foxcroft	John A. Wiles	Foxcroft	A. J. McNaughton	Foxcroft.
Sagadahoc County	David Scribner	Topsham	E. C. Patten	Topsham	I. R. Morrell	Brunswick.
Sagadahoc, Richmond Farmers' and Mechanics' Club	U. G. Patten	Gardiner	N. H. Skelton	Richmond	W. Fairclough	Richmond.
Somerset County	B. F. Burns	Madison	J. F. Withee	Madison	J. F. Withee	Madison.
Somerset, East	A. W. Miller	Hartland	E. B. Libby	Hartland	E. A. Webber	Hartland.
Somerset, Central	C. W. Day	Skowhegan	S. H. Bradbury	Skowhegan	J. W. Fogler	Skowhegan.
Somerset, Four County Fair Ass'n	C. A. Stevens	Pittsfield	John C. Gordon	Pittsfield	W. L. Pushor	Pittsfield.
Somerset, Embden	G. G. Palmer	North Anson, R. F. D. 1.	Chester K. Williams	North Anson, R. F. D. 1.	George Delling	North Anson, R. F. D. 1.
Somerset, Solon	D. S. Witham	Solon, R. F. D. 2.	M. P. Pollard	Solon, R. F. D. 1.	Grant Witham	Solon, R. F. D. 2.
Waldo and Penobscot	Frank A. Littlefield	Monroe	Fred H. Putnam	Monroe	G. A. Palmer	Monroe.
Waldo, Unity Park Association	J. H. Campbell	Plymouth	Edwin T. Reynolds	Unity	Edwin T. Reynolds	Unity.
Waldo, Tranquility Grange Agricultural Society	F. E. Hardy	Lincolnville	L. C. Rankin	Lincolnville	J. H. Peavey	Lincolnville.
Washington, West	R. M. Allen	Columbia Falls	Wm. N. Dyer	Harrington	E. V. Coffin	Harrington.
Washington, Machias Valley	Wm. G. Means	Machias	Samuel N. Tobey	Augusta (State Hospital).	Geo. B. Boynton	Machias.
Washington, Calais Fair Ass'n	Fred V. Packard	Calais	Thomas J. Doyle	Calais	E. E. Higgins	Calais.
York, Shapleigh and Acton	C. A. Butler	Emery Mills	Fred K. Bodwell	Acton	G. H. Twombley	Emery Mills.
York, Cornish Agricultural Ass'n	O. W. Adams	Cornish	William R. Copp	Cornish	Samuel G. Sawyer	Cornish.
York, Berwick Poultry Association	Thomas McIntyre	Berwick	A. C. Brooks	Berwick	A. C. Brooks	Berwick.
York, Grangers' Fair Association	John M. Deering	Saco, Boom Road	Wm. W. McIntyre	Saco, 22 Vernon St.	Alphonse E. Libby	Saco, 14 Summer St.
York County Poultry Association	Robert Rankin	Sanford	F. E. Young	Springvale	J. H. Tarbox	Sanford.

ANALYSIS OF EXHIBITIONS.

Name of Society.	Number of horses and colts.	Number of thoroughbred bulls and bull calves.	Number of thoroughbred cows, heifers and heifer calves.	Number of grade cows, heifers and heifer calves.	Number of oxen and steers.	Number of animals for beef.	Number of cattle shown in herds.	Total number of neat stock.	Number of sheep.	Number of swine.	Number of poultry (coops).
Maine State Agricultural Society	125	65	230	12	260	40	40	137	265	153	1,500
Eastern Maine Fair Association	43	25	76	–	–	36	–	137	186	22	510
Central Maine Fair Company	243	62	141	5	211	51	186	656	182	82	2,000
Maine State Pomological Society	–	–	–	–	–	–	–	–	–	–	–
Maine State Poultry Association	–	–	–	–	–	–	–	–	–	–	1,000
Androscoggin, Greene Town Fair Association	6	7	23	15	6	–	–	51	6	–	15
Aroostook, Northern Maine Fair Association	224	73	170	32	10	–	130	285	144	78	440
Aroostook, Houlton	100	75	100	50	4	75	300	604	100	50	204
Aroostook, Caribou Trotting Park and Fair Ass'n	71	7	28	9	–	–	–	44	6	–	23
Cumberland County	92	20	28	73	188	60	18	387	18	9	160
Cumberland Farmers' Club	10	5	2	16	28	6	–	57	5	–	–
Cumberland, New Gloucester and Danville	31	3	18	29	8	2	6	60	3	17	118
Cumberland, Freeport Poultry Association	–	–	–	–	–	–	–	–	–	–	528
Cumberland, Little Rigby Park	18	3	–	6	16	7	–	32	–	2	2
Cumberland, Bridgton Agricultural Society	10	5	10	9	34	10	–	68	–	10	5
Franklin County	83	50	125	150	300	136	96	857	138	13	255
Franklin, North	80	6	16	102	130	14	34	268	63	–	8
Hancock County	18	5	–	40	40	4	–	89	12	1	12
Hancock, Eden	4	2	6	8	–	–	–	16	16	5	14
Hancock, North Ellsworth Farmers' Club	–	–	–	–	–	–	–	–	–	–	4
Kennebec, South	17	9	12	24	110	6	–	161	–	21	3
Knox, North	33	10	21	32	74	18	18	173	20	3	21

Lincoln County	32	6	13	16	78	6	18	137	–	8	7
Lincoln, Bristol	16	–	–	4	14	–	–	18	–	–	8
Oxford County	132	45	100	104	128	4	59	440	92	12	138
Oxford, West	77	20	60	55	226	28	38	427	18	10	40
Oxford, Androscoggin Valley	45	25	60	64	112	8	39	308	16	–	51
Oxford, North	24	5	25	12	38	–	–	80	33	49	21
Oxford, Western Maine Poultry Association	–	–	–	–	–	–	–	–	–	–	451
Penobscot, West	72	10	48	40	34	–	30	162	78	35	109
Penobscot, North	12	1	–	8	–	–	–	9	–	–	3
Penobscot, Orrington	4	2	–	13	–	–	8	23	9	–	3
Penobscot, Bangor Poultry Association	–	–	–	–	–	–	–	–	–	–	–
Piscataquis County	36	10	40	48	2	–	36	136	–	–	3
Sagadahoc County	54	45	205	93	50	10	56	459	137	57	188
Sagadahoc, Richmond Farmers' and Mechanics' Club	14	2	7	11	16	–	–	36	–	–	14
Somerset County	34	12	26	37	50	16	15	156	70	–	36
Somerset, East	39	5	19	54	6	2	18	104	43	16	114
Somerset, Central	52	13	45	31	44	8	–	141	117	55	150
Somerset, Four County Fair Association	39	7	17	8	15	10	10	47	67	7	367
Somerset, Embden	23	4	24	12	8	–	32	45	7	–	–
Somerset, Solon	6	3	6	1	–	–	–	10	1	–	–
Waldo and Penobscot	53	16	65	79	94	40	66	360	38	1	10
Waldo, Unity Park Association	96	23	74	55	36	21	76	188	20	15	33
Waldo, Tranquility Grange Agricultural Society	12	–	–	11	4	–	9	24	3	–	3
Washington, West	28	12	30	31	16	–	–	89	44	14	17
Washington, Machias Valley	25	2	7	10	16	–	–	35	–	7	59
Washington, Calais Fair Association	6	8	5	24	–	–	–	37	12	10	396
York, Shapleigh and Acton	–	–	–	7	70	6	–	83	2	–	17
York, Cornish Agricultural Association	10	14	32	33	106	8	14	207	12	21	68
York, Berwick Poultry Association	–	–	–	–	–	–	–	–	–	–	225
York, Grangers' Fair Association	11	5	20	10	24	2	2	63	8	44	86
York County Poultry Association	–	–	–	–	–	–	–	–	–	–	546
	2,160	720	1,934	1,483	2,606	634	1,354	7,906	1,991	827	9,985

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 Society	$213 00	$30 00	$40 00	-	-	$37 50	-	$35 00	$145 50
Eastern Maine Fair Association	37 00	12 00	10 00	$6 00	$14 00	21 00	$18 00	56 00	76 00
Central Maine Fair Company	61 50	35 00	160 00	49 00	-	-	-	-	210 00
Maine State Pomological Society	-	-	-	-	-	-	-	-	-
Maine State Poultry Association	-	-	-	-	-	-	-	-	-
Androscoggin, Greene Town Fair Association	-	-	-	-	-	-	-	5 25	-
Aroostook, Northern Maine Fair Association	33 00	20 00	94 00	151 00	7 00	15 00	26 00	428 00	103 00
Aroostook, Houlton	-	-	200 00	100 00	54 00	6 00	-	210 00	68 00
Aroostook, Caribou Trotting Park and Fair Association	5 00	5 00	8 00	10 00	-	11 00	2 00	50 00	32 00
Cumberland County	-	15 00	-	20 00	30 00	-	-	8 00	12 00
Cumberland Farmers' Club	2 00	3 00	2 00	-	-	-	-	3 50	-
Cumberland, New Gloucester and Danville	12 00	8 00	6 00	-	5 00	5 00	-	9 50	22 00
Cumberland, Freeport Poultry Association	-	-	-	-	-	-	-	-	-
Cumberland, Little Rigby Park	3 00	3 00	3 00	-	3 00	-	-	3 00	16 00
Cumberland, Bridgton Agricultural Society	-	-	-	20 40	4 00	4 00	-	13 00	-
Franklin County	3 00	9 00	19 00	19 00	16 00	26 00	-	18 00	93 00
Franklin, North	3 50	6 00	1 00	4 50	-	6 00	4 00	17 10	30 00
Hancock County	-	-	-	3 00	3 00	5 00	-	22 00	15 00
Hancock, Eden	-	-	-	-	-	-	-	10 00	-
Hancock, North Ellsworth Farmers' Club	-	-	-	-	-	5 20	-	-	-
Kennebec, South	-	-	5 00	3 00	-	-	-	18 00	-
Knox, North	3 00	-	-	3 50	3 00	2 50	-	19 75	34 00

Lincoln County	4 00	-	-	-	3 00	8 00	-	7 00	23 75
Lincoln, Bristol	-	-	-	3 00	-	-	-	-	-
Oxford County	34 00	27 00	6 00	12 00	57 00	25 00	-	83 00	175 00
Oxford, West	27 00	12 15	44 55	9 45	-	-	16 20	10 00	16 20
Oxford, Androscoggin Valley	10 00	10 00	5 00	5 00	6 00	10 00	10 00	42 00	80 00
Oxford, North	-	3 75	-	2 00	-	-	-	7 25	64 00
Oxford, Western Maine Poultry Association	-	-	-	-	-	-	-	-	-
Penobscot, West	-	3 00	6 00	6 00	-	10 00	5 00	35 50	107 00
Penobscot, North	1 50	-	-	3 00	-	-	2 00	-	1 00
Penobscot, Orrington	-	-	-	2 50	-	4 50	-	-	-
Penobscot, Bangor Poultry Association	-	-	-	-	-	-	-	-	-
Piscataquis County	4 50	-	4 50	2 70	7 20	-	2 70	3 60	57 73
Sagadahoc County	27 00	5 00	26 00	10 00	8 00	-	-	40 00	147 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	-	-	1 00	1 00	-	-	-	1 75	8 00
Somerset County	10 00	10 00	10 00	6 00	6 00	10 00	5 00	15 50	20 00
Somerset, East	6 00	-	14 00	12 00	-	12 00	-	38 00	41 00
Somerset, Central	15 00	4 00	25 00	22 00	5 00	18 00	12 00	26 00	98 00
Somerset, Four County Fair Association	14 00	-	13 00	4 00	-	8 00	-	12 00	150 00
Somerset, Embden	-	-	3 00	-	-	-	-	12 00	26 00
Somerset, Solon	-	-	-	-	-	-	-	8 00	14 00
Waldo and Penobscot	15 00	5 00	6 00	5 00	12 00	60 00	18 00	19 00	131 00
Waldo, Unity Park Association	17 50	6 00	20 00	6 00	12 00	8 00	16 00	27 50	33 00
Waldo, Tranquility Grange Agricultural Society	-	-	-	-	-	2 00	-	4 00	5 00
Washington, West	-	-	-	-	-	25 00	-	23 00	91 00
Washington, Machias Valley	13 00	12 00	16 00	5 00	-	-	-	20 00	-
Washington, Calais Fair Association	-	-	-	-	-	-	-	22 00	-
York, Shapleigh and Acton	-	-	-	-	-	-	-	-	-
York, Cornish Agricultural Association	4 00	4 00	4 00	6 00	2 00	2 00	-	8 00	-
York, Berwick Poultry Association	-	-	-	-	-	-	-	-	-
York, Grangers' Fair Association	-	-	-	-	-	-	-	12 00	54 00
York County Poultry Association	-	-	-	-	-	-	-	-	-
	$578 50	$247 90	$752 05	$512 05	$257 20	$346 70	$136 90	$1,403 20	$2,199 18

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 Society	$231 00	$743 25	$23 00	$334 00	$42 00	$149 00	$10 00	$169 00	$185 00	$385 95
Eastern Maine Fair Association	119 00	297 00	-	96 00	-	-	-	-	-	-
Central Maine Fair Company	237 50	487 50	25 00	267 00	97 00	117 50	-	135 00	115 00	225 00
Maine State Pomological Society	-	-	-	-	-	-	-	-	-	-
Maine State Poultry Association	-	-	-	-	-	-	-	-	-	-
Androscoggin, Greene Town Fair Association	4 75	16 50	4 50	8 50	1 00	-	1 00	-	-	-
Aroostook, Northern Maine Fair Association	472 00	948 00	61 00	207 00	-	22 00	8 00	-	-	15 00
Aroostook, Houlton	325 00	485 00	40 00	236 00	-	14 00	-	62 00	-	-
Aroostook, Caribou Trotting Park and Fair Association	25 00	68 00	25 00	-	-	-	-	-	-	-
Cumberland County	18 00	34 00	206 00	25 00	175 00	42 00	60 00	112 00	-	30 00
Cumberland Farmers' Club	12 00	5 00	22 00	-	31 00	17 00	-	11 00	15 00	35 00
Cumberland, New Gloucester and Danville	5 00	24 00	27 00	4 00	2 00	6 00	-	2 00	5 00	6 00
Cumberland, Freeport Poultry Association	-	-	-	-	-	-	-	-	-	-
Cumberland, Little Rigby Park	6 00	-	15 00	-	-	9 00	-	6 00	8 00	10 00
Cumberland, Bridgton Agricultural Society	8 00	15 00	8 00	-	15 00	10.00	-	6 00	12 00	40 00
Franklin County	94 00	184 00	86 50	91 50	37 00	114 00	11 00	27 00	179 00	100 00
Franklin, North	8 50	11 60	30 45	24 00	5 25	10 40	2 50	6 50	36 34	30 00
Hancock County	18 00	-	62 50	10 00	32 50	7 50	-	5 00	-	116 00
Hancock, Eden	8 00	25 00	20 00	-	-	-	-	-	-	-
Hancock, North Ellsworth Farmers' Club	5 00	6 00	13 00	-	-	-	-	-	-	-
Kennebec, South	17 00	18 50	23 25	-	17 00	28 00	6 00	11 25	57 00	34 25
Knox, North	21 75	28 50	44 00	17 00	15 00	12 50	-	19 00	34 00	39 00

Lincoln County	14 50	13 75	20 00	8 00	–	17 00	–	4 50	32 00	84 60
Lincoln, Bristol	–	–	2 50	–	3 00	2 75	–	–	–	–
Oxford County	197 00	228 00	216 00	86 00	166 00	52 00	–	16 00	95 00	308 00
Oxford, West	64 80	162 67	176 17	126 60	54 00	60 75	6 75	27 00	210 60	190 75
Oxford, Androscoggin Valley	42 00	78 00	49 30	39 00	9 00	54 00	5 00	9 00	58 00	58 00
Oxford, North	15 00	53 00	18 00	15 00	59 75	6 00	–	–	8 00	–
Oxford, Western Maine Poultry Association	–	–	–	–	–	–	–	–	–	–
Penobscot, West	30 00	140 50	66 25	30 00	54 00	10 00	10 00	–	–	–
Penobscot, North	1 50	–	5 25	–	–	–	–	–	–	–
Penobscot, Orrington	4 50	–	8 75	6 00	–	–	1 00	–	–	–
Penobscot, Bangor Poultry Association	–	–	–	–	–	–	–	–	–	–
Piscataquis County	9 00	33 25	23 85	26 10	1 80	–	–	–	–	–
Sagadahoc County	205 00	937 75	219 00	140 00	50 00	28 00	4 00	25 00	30 00	216 00
Sagadahoc, Richmond Farmers' and Mechanics Club	1 30	3 70	2 70	1 00	–	3 00	30	–	–	4 00
Somerset County	15 00	32 00	47 50	10 00	32 50	26 50	–	24 00	41 00	44 00
Somerset, East	17 00	28 50	60 00	18 00	14 00	–	–	23 00	–	–
Somerset, Central	49 00	91 00	53 50	–	30 50	31 00	–	18 00	56 00	60 00
Somerset, Four County Fair Association	25 00	54 00	24 00	10 00	21 50	–	–	23 00	25 00	10 00
Somerset, Embden	11 00	13 00	4 00	17 00	–	3 00	–	–	–	–
Somerset, Solon	3 00	3 00	1 50	5 00	–	–	–	–	–	–
Waldo and Penobscot	37 00	96 00	79 50	123 00	20 00	21 00	9 00	48 00	16 00	103 00
Waldo, Unity Park Association	45 00	60 00	38 75	86 00	18 50	22 00	5 75	26 25	12 00	20 00
Waldo, Tranquility Grange Agricultural Society	–	–	9 00	8 00	–	4 00	–	–	5 00	–
Washington, West	72 00	146 00	84 00	–	–	30 00	–	–	–	–
Washington, Machias Valley	8 00	24 00	19 50	–	10 00	–	10 00	–	–	–
Washington, Calais Fair Association	90 00	70 00	55 00	–	–	–	–	–	–	–
York, Shapleigh and Acton	–	–	6 50	–	6 00	36 50	–	6 00	35 00	12 00
York, Cornish Agricultural Association	64 00	150 00	93 00	28 00	130 00	66 00	9 00	20 00	80 00	61 00
York, Berwick Poultry Association	–	–	–	–	–	–	–	–	–	–
York, Grangers' Fair Association	25 00	34 00	19 00	3 00	18 00	–	–	5 00	–	47 00
York County Poultry Association	–	–	–	–	–	–	–	–	–	–
	$2,681 10	$5,848 97	$2,138 72	$2,105 70	$1,168 30	$1,032 40	$159 30	$846 50	$1,349 94	$2,284 55

ANALYSIS OF AWARDS—Concluded.

Name of Society.	Amount of premiums awarded sheep.	Amount of premiums awarded swine.	Amount of premiums awarded poultry.	Amount of premiums awarded grain and root crops.	Amount of premiums awarded fruit and flowers.	Amount of premiums awarded bread and dairy products.	Amount of premiums awarded honey, sugar and syrups.	Amount of premiums awarded agricultural implements.	Amount of premiums awarded household manufacturers and needle-work.	Amount of premiums awarded objects not named above.	Total amount of premiums and gratuities awarded.
Maine State Agricultural Society..	$832 00	$243 00	$525 85	$142 00	$211 00	$90 00	$16 00	-	$102 50	$277 95	$5,213 50
Eastern Maine Fair Association...	275 00	76 00	185 40	199 50	284 50	279 50	-	-	200 01	211 00	2,472 91
Central Maine Fair Company.....	560 00	175 00	883 00	85 00	210 00	287 20	55 00	-	356 25	720 00	5,553 45
Maine State Pomological Society..	-	-	-	-	428 00	-	-	-	-	-	428 00
Maine State Poultry Association..	-	-	1,342 75	-	-	-	-	-	-	-	1,342 75
Androscoggin, Greene Town Fair Association..................	2 50	-	9 50	8 00	23 00	6 50	-	-	6 25	7 25	104 50
Aroostook, Northern Maine Fair Association..................	346 50	288 00	400 25	203 95	209 50	55 25	49 00	-	311 40	494 30	4,968 15
Aroostook, Houlton.............	150 00	75 00	200 00	83 00	56 00	25 00	13 00	-	214 10	25 00	2,641 10
Aroostook, Caribou Trotting Park and Fair Association...........	3 00	-	12 50	6 90	4 75	12 00	9 00	-	41 60	34 00	364 75
Cumberland County.............	16 00	2 00	152 00	42 00	12 00	9 00	-	$4 00	7 00	1 20	1,032 20
Cumberland Farmers' Club.......	8 00	-	42 50	14 25	16 00	-	8 25	-	42 75	11 25	301 50
Cumberland, New Gloucester and Danville......................	2 00	11 00	39 75	27 10	16 65	9 00	14 25	-	14 80	45 00	328 05
Cumberland, Freeport Poultry Association....................	-	-	384 70	-	-	-	-	-	-	-	384 70
Cumberland, Little Rigby Park...	-	6 00	2 50	-	-	-	-	-	-	53 50	147 00
Cumberland, Bridgton Agricultural Society......................	-	9 00	3 20	1 20	3 60	2 40	1 60	-	48 00	60 00	284 40
Franklin County................	134 50	12 50	133 50	24 70	82 00	29 00	1 70	-	130 05	63 61	1,738 56
Franklin, North................	30 00	-	3 65	9 15	6 45	1 40	6 90	-	34 00	18 00	347 19
Hancock County................	10 00	4 00	11 00	58 35	35 35	10 00	-	-	59 75	4 75	492 70
Hancock, Eden..................	8 45	5 00	25 00	20 00	40 00	15 00	3 00	10 00	25 00	21 00	235 45

Hancock, North Ellsworth Farmers' Club	-	-	4 00	28 95	32 00	1 75	50	-	17 60	1 00	115 00
Kennebec, South	-	9 00	3 00	19 10	6 45	6 15	-	-	38 15	45 00	365 10
Knox, North	13 50	8 50	19 25	60 00	50 55	4 00	5 30	-	19 75	37 90	515 25
Lincoln County	-	-	7 50	22 00	30 45	-	2 00	-	48 95	13 00	364 00
Lincoln, Bristol	-	-	7 50	4 45	6 90	1 75	1 00	-	17 90	6 10	56 85
Oxford County	74 00	43 00	140 00	81 50	324 25	33 10	19 00	32 00	153 90	422 00	3,105 75
Oxford, West	33 75	13 50	37 12	41 50	34 50	19 50	14 00	-	33 40	297 05	1,739 96
Oxford, Androscoggin Valley	11 00	-	48 00	22 65	20 75	12 30	6 00	-	13 75	151 00	864 75
Oxford, North	17 00	18 00	15 00	12 00	8 00	12 00	5 00	-	29 94	20 00	388 69
Oxford, Western Maine Poultry Association	-	-	572 50	-	-	-	-	-	-	-	572 50
Penobscot, West	95 00	33 00	89 25	68 40	51 15	27 40	17 55	-	91 20	98 91	1,085 11
Penobscot, North	-	-	1 50	-	50 00	3 50	-	-	109 25	-	178 50
Penobscot, Orrington	6 00	-	1 75	6 70	13 60	1 00	1 25	-	58 25	8 00	123 80
Penobscot, Bangor Poultry Ass'n	-	-	839 47	-	-	-	-	-	-	-	839 47
Piscataquis County	-	-	3 82	8 55	4 73	2 70	-	-	-	32 30	229 03
Sagadahoc County	227 50	45 00	272 50	210 25	35 00	75 00	12 00	-	96 30	130 20	3,221 50
Sagadahoc, Richmond Farmers' and Mechanics' Club	-	-	2 35	10 60	9 05	1 85	-	-	10 55	9 20	71 35
Somerset County	46 25	-	13 90	8 70	5 25	1 00	-	-	29 35	7 25	476 70
Somerset, East	63 50	22 00	120 40	52 00	24 00	36 00	2 00	-	40 45	67 50	711 35
Somerset, Central	220 50	36 00	101 50	37 35	12 50	16 50	5 00	-	42 50	8 00	1,093 85
Somerset, Four County Fair Ass'n	100 00	8 00	281 50	30 75	4 50	6 75	6 00	-	34 25	99 25	964 50
Somerset, Embden	3 00	-	-	7 00	-	-	-	-	-	-	99 00
Somerset, Solon	-	-	-	-	-	-	-	-	-	6 00	40 50
Waldo and Penobscot	47 00	5 00	16 00	48 50	45 50	18 00	3 50	-	95 75	-	1,102 75
Waldo, Unity Park Association	8 00	4 75	24 00	27 50	11 25	10 00	17 50	6 00	70 25	72 25	731 75
Waldo, Tranquility Grange Agricultural Society	1 50	-	1 50	5 00	9 25	2 75	-	-	9 50	23 50	90 00
Washington, West	76 00	21 00	16 00	57 25	57 50	20 45	2 25	-	136 75	-	858 20
Washington, Machias Valley	-	-	82 55	73 05	66 65	19 75	75	2 00	91 05	15 75	489 05
Washington, Calais Fair Ass'n	18 00	21 00	184 00	85 60	70 55	42 75	-	-	199 75	-	858 65
York, Shapleigh and Acton	1 75	-	15 00	70 00	50 00	7 50	10 00	-	40 00	91 50	387 75
York, Cornish Agricultural Ass'n	13 00	22 00	124 00	9 00	11 50	4 75	12 00	-	48 40	-	975 65
York, Berwick Poultry Association	-	-	93 50	-	-	-	-	-	-	-	93 50
York, Grangers' Fair Association	5 00	13 00	75 00	20 00	5 50	5 25	2 50	-	23 75	-	367 00
York County Poultry Association	-	-	532 00	-	-	-	-	-	-	-	532 00
	$3,459 20	$1,229 25	$8,102 41	$2,053 45	$2,690 13	$1,224 70	$322 80	$54 00	$3,194 10	$3,710 47	$52,089 67

FINANCES.

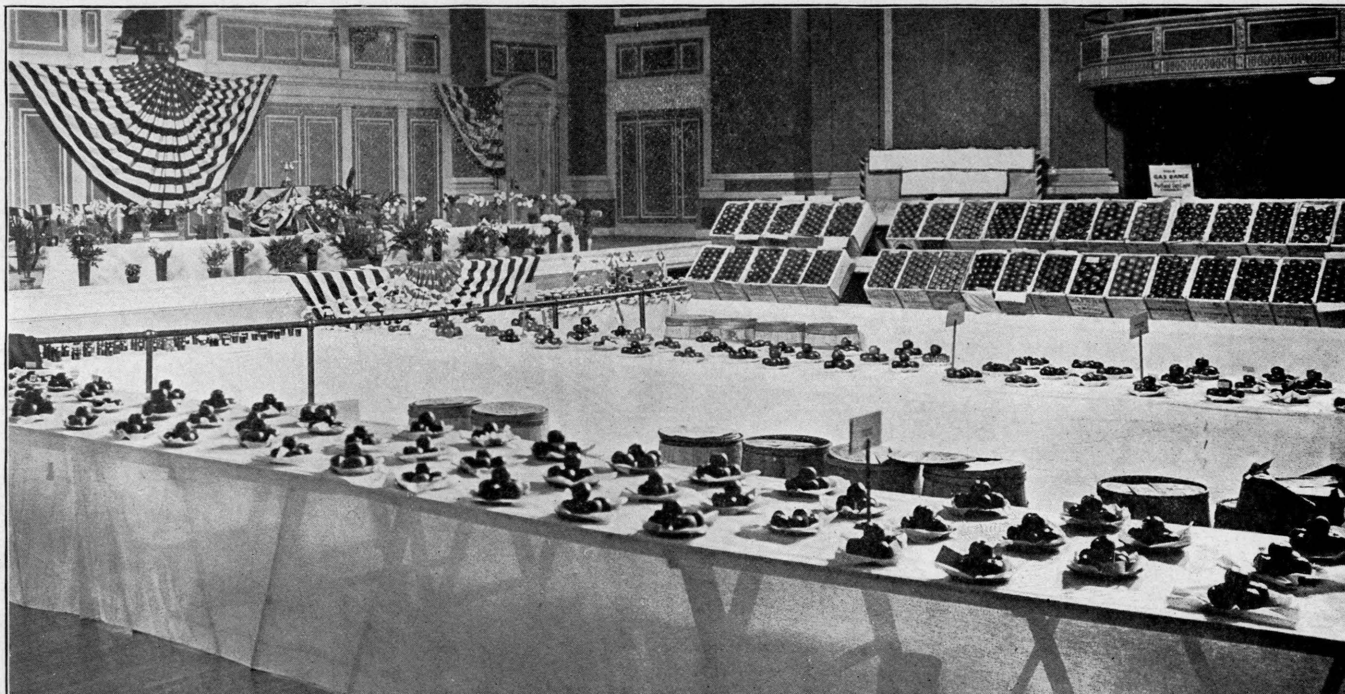
Name of Society.	Amount received from State.	Receipts for membership.	Receipts from loans.	Receipts from entry fees for trotting purses.	Receipts from all other sources.	Total receipts.
Maine State Agricultural Society	$2,500 00	-	$400 00	$1,567 00	$16,362 20	$20,829 20
Eastern Maine Fair Association	1,750 00	-	3,295 20	547 50	9,746 36	15,339 06
Central Maine Fair Company	2,500 00	-	-	929 50	14,823 85	18,253 35
Maine State Pomological Society	1,884 33	$105 00	200 00	-	929 68	3,119 01
Maine State Poultry Association	988 75	106 00	-	-	775 85	1,870 60
Androscoggin, Greene Town Fair Association	34 47	-	-	-	144 46	178 93
Aroostook, Northern Maine Fair Association	1,916 27	38 00	6,300 00	1,382 00	13,018 58	22,654 85
Aroostook, Houlton	1,175 04	25 00	1,800 00	1,380 00	7,328 96	11,709 00
Aroostook, Caribou Trotting Park and Fair Association	-	-	-	645 00	1,857 50	2,502 50
Cumberland County	557 93	-	-	-	5,230 21	5,788 14
Cumberland Farmers' Club	155 00	32 00	-	320 00	1,825 39	2,332 39
Cumberland, New Gloucester and Danville	97 93	35 00	275 00	67 50	781 72	1,257 15
Cumberland, Freeport Poultry Association	141 60	18 00	125 00	-	326 64	611 24
Cumberland, Little Rigby Park	53 98	-	-	210 00	821 64	1,085 62
Cumberland, Bridgton Agricultural Society	-	-	-	300 00	1,425 26	1,725 26
Franklin County	672 64	744 00	-	640 00	4,287 43	6,344 07
Franklin, North	132 89	292 00	650 00	297 50	624 02	1,996 41
Hancock County	150 12	-	-	285 25	2,387 84	2,823 21
Hancock, Eden	85 24	-	-	20 00	1,413 10	1,518 34
Hancock, North Ellsworth Farmers' Club	41 54	50	-	-	285 60	327 64
Kennebec, South	184 08	10 00	135 00	8 75	937 67	1,275 50
Knox, North	215 93	-	-	26 25	2,704 82	2,947 00
Lincoln County	172 78	2 00	375 00	44 25	1,664 89	2,258 92
Lincoln, Bristol	50 73	25	-	-	257 67	308 65
Oxford County	1,270 71	25 00	300 00	712 50	6,521 94	8,830 15
Oxford, West	685 89	200 00	1,000 00	480 00	2,089 79	4,455 68

Oxford, Androscoggin Valley	430 93	-	900 00	340 00	2,028 74	3,699 67
Oxford, North	137 20	28 00	-	150 10	749 08	1,064 38
Oxford, Western Maine Poultry Association	251 41	17 00	-	-	626 26	894 67
Penobscot, West	412 96	31 00	300 00	317 50	2,273 05	3,334 51
Penobscot, North	71 07	-	-	350 00	1,332 43	1,753 50
Penobscot, Orrington	56 67	20 00	-	144 00	894 10	1,114 77
Penobscot, Bangor Poultry Association	-	71 00	400 00	-	671 05	1,142 05
Piscataquis County	119 89	-	-	-	1,338 43	1,458 32
Sagadahoc County	1,298 75	30 00	3,937 11	1,065 00	8,263 15	14,594 01
Sagadahoc, Richmond Farmers' and Mechanics' Club	31 24	1 00	11 00	1 50	100 00	144 74
Somerset County	210 51	-	389 60	220 00	740 60	1,560 71
Somerset, East	332 54	40 00	-	86 25	1,118 58	1,577 37
Somerset, Central	455 09	70 00	-	417 75	3,591 44	4,534 28
Somerset, Four County Fair Association	-	2,245 00	745 00	187 50	3,185 38	6,362 88
Somerset, Embden	39 23	-	-	-	85 13	124 36
Somerset, Solon	-	-	7 00	-	33 50	40 50
Waldo and Penobscot	395 35	-	-	230 75	1,982 25	2,608 35
Waldo, Unity Park Association	289 11	-	-	110 00	1,150 00	1,549 11
Waldo, Tranquility Grange Agricultural Society	-	3 00	35 00	39 10	-	77 10
Washington, West	394 49	-	750 00	470 00	2,620 12	4,234 61
Washington, Machias Valley	183 49	-	900 00	480 00	2,866 75	4,430 24
Washington, Calais Fair Association	349 18	-	250 00	902 00	3,434 00	4,935 18
York, Shapleigh and Acton	162 06	184 00	60 00	-	41 58	447 63
York, Cornish Agricultural Association	383 06	-	-	500 00	2,356 92	3,239 98
York, Berwick Poultry Association	54 19	15 00	-	82 00	118 75	269 94
York, Grangers' Fair Association	102 61	-	-	180 00	1,189 30	1,471 91
York County Poultry Association	278 29	31 00	-	228 00	70 00	607 29
	$23,857 16	$4,418 75	$23,539 91	$16,364 45	$141,433 66	$209,613 93

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 Society	$300 00	$3,810 00	$3,533 37	$5,504 17	$18,361 04	$66,000 00	$12,900 00
Eastern Maine Fair Association	1,292 96	1,886 00	4,838 19	4,848 44	15,338 50	40,000 00	4,806 93
Central Maine Fair Company	1,747 49	2,652 50	7,675 92	599 83	18,229 19	-	-
Maine State Pomological Society	-	-	-	1,832 69	2,260 69	-	-
Maine State Poultry Association	-	-	-	-	-	1,750 00	-
Androscoggin, Greene Town Fair Association	-	-	49 87	-	154 37	-	-
Aroostook, Northern Maine Fair Association	501 28	3,400 00	6,605 51	6,723 06	22,198 00	42,500 00	11,700 00
Aroostook, Houlton	-	2,921 00	5,233 43	900 00	11,695 53	20,000 00	18,000 00
Aroostook, Caribou Trotting Park and Fair Association	500 00	2,100 00	620 35	-	3,585 10	25,000 00	15,000 00
Cumberland County	450 00	1,850 00	2,300 00	-	5,632 20	6,000 00	500 00
Cumberland Farmers' Club	157 96	800 00	555 62	405 90	2,220 98	4,341 29	300 00
Cumberland, New Gloucester and Danville	95 00	435 00	129 00	240 11	1,227 16	3,500 00	275 00
Cumberland, Freeport Poultry Association	4 30	-	137 63	-	526 63	-	-
Cumberland, Little Rigby Park	27 30	525 00	349 56	24 30	1,073 16	2,000 00	-
Cumberland, Bridgton Agricultural Society	-	1,200 00	1,201 20	-	2,685 60	3,000 00	-
Franklin County	1,545 82	1,600 00	1,514 87	-	6,399 25	20,000 00	384 32
Franklin, North	250 00	675 00	121 75	949 66	2,343 60	2,500 00	2,600 00
Hancock County	100 00	792 00	-	1,074 97	2,459 67	2,500 00	-
Hancock, Eden	147 99	250 00	275 00	124 00	1,032 44	3,000 00	1,200 00
Hancock, North Ellsworth Farmers' Club	-	5 20	111 77	65 09	297 06	1,200 00	-
Kennebec, South	-	170 00	141 80	450 03	1,126 93	1,000 00	700 00
Knox, North	200 00	553 75	680 35	827 80	2,777 15	1,500 00	125 00
Lincoln County	-	364 00	295 44	1,235 48	2,258 92	2,000 00	377 17
Lincoln, Bristol	25 00	-	178 60	5 00	265 45	1,200 00	175 00

Oxford County	1,058 07	1,800 00	1,781 30	955 64	8,700 76	12,000 00	300 00
Oxford, West	500 00	1,200 00	630 75	116 25	4,186 96	12,000 00	-
Oxford, Androscoggin Valley	169 57	850 00	357 00	1,224 69	3,466 01	6,000 00	2,400 00
Oxford, North	200 00	300 00	237 33	-	1,126 02	1,500 00	260 00
Oxford, Western Maine Poultry Association	10 00	-	133 93	-	716 43	400 00	-
Penobscot, West	494 50	800 00	380 06	570 84	3,330 51	6,000 00	5,000 00
Penobscot, North	500 00	750 00	250 00	75 00	1,753 50	3,000 00	-
Penobscot, Orrington	-	244 75	95 00	589 61	1,053 16	-	-
Penobscot, Bangor Poultry Association	40 00	-	260 44	-	1,139 91	450 00	-
Piscataquis County	-	383 73	441 41	258 12	1,312 29	3,000 00	2,700 00
Sagadahoc County	350 00	2,500 00	1,523 00	4,199 51	11,794 01	10,000 00	28,000 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	-	-	58 00	-	129 35	-	-
Somerset County	25 00	550 00	285 25	223 76	1,560 71	1,000 00	853 00
Somerset, East	74 00	575 00	510 69	62 35	1,933 39	2,200 00	1,810 21
Somerset, Central	495 47	1,026 00	1,269 37	495 88	4,380 57	4,500 00	2,500 00
Somerset, Four County Fair Association	2,084 96	730 00	1,072 75	1,000 00	5,852 21	4,650 00	2,197 28
Somerset, Embden	-	-	17 25	-	116 25	5 00	-
Somerset, Solon	-	-	-	-	-	-	-
Waldo and Penobscot	-	570 00	907 12	20 00	2,599 87	4,500 00	1,915 00
Waldo, Unity Park Association	100 00	600 00	300 00	-	1,731 75	-	182 64
Waldo, Tranquility Grange Agricultural Society	12 00	-	25 00	-	127 00	2,000 00	-
Washington, West	578 54	1,200 00	2,602 11	-	5,238 85	1,926 00	2,250 00
Washington, Machias Valley	229 23	1,250 00	1,491 78	400 00	3,860 06	250 50	243 15
Washington, Calais Fair Association	75 00	2,150 00	849 02	900 15	4,832 82	11,000 00	4,350 00
York, Shapleigh and Acton	-	-	32 50	15 25	435 50	2,000 00	-
York, Cornish Agricultural Association	87 20	1,180 00	784 35	84 95	3,112 15	4,500 00	400 00
York, Berwick Poultry Association	-	-	233 26	-	326 76	245 00	313 72
York, Grangers' Fair Association	71 07	475 00	450 79	35 00	1,398 86	75 00	-
York County Poultry Association	-	-	266 44	53 20	851 64	650 00	450 00
	$14,499 71	$45,123 93	$53,795 13	$8,983 62	$201,215 92	$342,842 79	$125,168 42



Looking across the upper end of City Hall, at Annual Meeting, Maine State Pomological Society, Portland, Nov. 2-4, 1915.

ANNUAL REPORT

OF THE

State Pomological Society

1915

OFFICERS FOR 1915.

President.

W. H. CONANT, Buckfield

Vice-Presidents.

GEO. A. YEATON, Norway
LYMAN K. LEE, Foxcroft

Secretary.

E. L. WHITE, Bowdoinham

Treasurer.

T. E. CHASE, Buckfield

Executive Committee.

The President and Secretary, *ex officio.*

F. H. MORSE, Waterford
E. F. HITCHINGS, Orono
H. L. KEYSER, Greene

Members Experiment Station Council.

HOWARD L. KEYSER, Greene

Vice-President N. E. Fruit Show.

W. H. CONANT, Buckfield

Trustees.

Androscoggin County—A. H. CONANT, Auburn
Cumberland County—H. P. SWEETSER, Cumberland Centre
Franklin County—MISS LIZZIE E. BASS, Wilton
Hancock County—C. L. MORANG, Ellsworth
Kennebec County—CLEMENT & TAYLOR, Winthrop
Knox County—FRED A. GLEASON, Union
Lincoln County—W. C. FORD, Whitefield
Oxford County—A. A. HERRICK, Norway
Penobscot County—ERNEST PAGE, East Corinth
Piscataquis County—LYMAN LEE, Foxcroft
Sagadahoc County—T. W. SKELTON, Bowdoinham
Somerset County—R. T. PATTEN, Skowhegan
Waldo County—HARRY W. LITTLEFIELD, Brooks
Washington County—DAVID CAMPBELL, Cherryfield
York County—C. E. FELCH, Limerick

CONTENTS.

MEMBERS OF THE SOCIETY.

LIFE MEMBERS.

Allen, W. H.................. Buckfield
Andrews, Charles E.............. Auburn
Atherton, Wm. P.............. Hallowell
Atkins, Charles G.............. Bucksport
Averill, David C.............. Temple
Bailey, W. G.................. Freeport
Bennoch, John E................ Orono
Bickford, Lewis I........ Dixmont Center
Bisbee, George E................ Auburn
Bisbee, Stanley............ Rumford Falls
Blaisdell, A. L................ Winterport
Blossom, O. E............ Turner Center
Briggs, John.................... Turner
Burleigh, Miss Clara M........ Vassalboro
Burr, John...................... Freeport
Butler, Charles M............ Wiscasset
Butler, Alonzo.................... Union
Butnam, J. W.................. Readfield
Chadbourne, C. L........ North Bridgton
Chandler, Mrs. Lucy A........ Freeport
Chase, Henry M., 103 Federal St.. Portland
Chase, Homer N.................. Auburn
Chase, Thomas E.............. Buckfield
Clement & Taylor............. Winthrop
Conant, A. A.................... Hebron
Conant, E. E.................... Hebron
Conant, Geo. I.................. Hebron
Conant, H. L............ Hebron Station
Conant, W. H.................. Buckfield
Conant. W. G.................... Hebron
Corbett, Herman............ Farmington
Crowell, Mrs. Ella H........ Skowhegan
Crowell, John H............ Farmington
Dana, Woodbury S............ Westbrook
Dawes, S. H.................. Harrison
Dearborn, Hall C.... Hampden Highlands
DeCoster, Virgil P............ Buckfield
Denison, Mrs. Cora M........... Harrison
DeRocher, Peter........ Bradentown, Fla.
Dirwanger, Joseph A............ Portland
Douglass, C. S............. Douglass Hill
Dunham, W. W............... North Paris
Emerson, Charles L.......... South Turner
Farnsworth, B. B.............. Portland
Felch, Chas. E................. Limerick
Fish, Mrs. Benj............. Winterport
Flint, John M............... W. Baldwin
French, H. C............ Rumford Center
Frost, Oscar F.............. Monmouth
Gardiner, Robert H............ Gardiner
George, C. H.................... Hebron
Goddard, Lewis C............ Woodfords
Grover, Franklin D................ Bean
Gulley, Alfred G............ Storrs, Conn.
Gurney, F. E.................... Hebron
Hackett, E. C.......... West Gloucester
Hall, Mrs. H. A................ Brewer
Hardy, E. E................ Farmington
Hardy, Walter M................ Brewer
Hayes, William................ Gardiner
Heald, U. H...................... Paris
Herrick, A. A.................. Norway
Hinds, W. C.................. Winthrop
Hitchings, E. F.................. Orono
Hoyt, Mrs. Frances............ Winthrop
Jackson, F. A.................. Winthrop
Keene, Charles S................ Turner
Keyser, Howard L............... Greene
Lang, Ivan E.................. Augusta
Lapham, E. A.................. Pittston
Leavitt, L. C.............. Kezar Falls
Lee, Lyman K.................. Foxcroft
Lincoln, E. L.................... Wayne
Litchfield, J. H................ Auburn
Littlefield, Harry W............ Brooks
Lombard, Thurston M............ Auburn
Lord, J. Merrill.............. Kezar Falls
Luce, Willis A............ Mabton, Wash.
Macauley, T. B.......... Montreal, Can.
Martin, John J., 270 Center St.... Bangor
McAllister, Zaccheus........ West Lovell
McCabe, George L........ North Bangor
McLaughlin, Mrs. Edna G........ Exeter
McLaughlin, Henry.............. Bangor
Merrill, H. H.................. Hebron
Merrill, Oliver F.............. Gardiner
Merrill, Rupert B.............. Gardiner
Millspaugh, L. H.............. Winthrop
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
Newell, G. E.................... Turner
Page, E. E................ East Corinth
Page, F. W.................... Augusta
Palmer, George L.......... Kent's Hill
Parsons, Howard G........ Turner Center
Patten, Mrs. E. C............ Topsham
Prince, Edward M...... West Farmington
Pope, Charles S............ Manchester
Pulsifer, D. W................... Poland
Richards, John T.............. Gardiner
Ricker, A. S.................... Turner
Ricker, Fred P.................. Turner
Roak, George M.................. Auburn
Robinson, W. C............ North Anson
Rogers, Mrs. Jeannette.... North Newburg
Sawyer, Andrew S........ Cape Elizabeth
Sawyer, Charles F............... Hebron
Saunders, Ernest.............. Lewiston
Seavey, Mrs. G. M.............. Auburn
Skillings, C. W............ North Auburn
Smith, Frederick O......... New Vineyard
Smith, V. N.................. Buckfield
Stanley, H. O.................. Winthrop
Staples, George W., 904 Main St., Hartford, Conn.
Stilphen, Asbury C.............. Gardiner
Supt. Maine Sanatorium Farm.... Hebron
Sweetser, F. R........ Cumberland Center
Taylor, Miss L. L. (Lakeside).. Belgrade
Thomas, William W............ Portland
Thomas, D. S.............. North Auburn
Thurston, Edwin.......... West Farmington
Townsend, Mrs. B. T.......... Freeport
True, John W............ New Gloucester
Twitchell, George M............ Auburn
Verrill, Harry M.............. Portland
Vickery, James................ 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
Whitman, L. E..................Hebron
Woods, Charles D................Orono
Wright, Frederick..................Bath
Yeaton, George A..............Augusta
Yeaton, Samuel F.....West Farmington

ANNUAL MEMBERS FOR 1915.

Bass, Lizzie E..................Wilton
Bass, Mary A..................Wilton
Berry, W. H................East Hebron
Bessey, W. A...................Hebron
Bicknell, Charles E............Rockland
Blanchard, Ray M............Buckfield
Bodwell, Joseph R..............Foxcroft
Bowers, Dr. J. W..............Portland
Brown, Sydney F..........East Sumner
Codwell, Roy...................Hebron
Conant, Charles M..........Winterport
Conant, W. R................Buckfield
Cressey, E. B..................Standish
Cumberland Nurseries, The Winchester, Tenn.
Dolloff, E. W..................Standish
Dolloff, H. W..............Sebago Lake
Elder, George K..............Lewiston
Elwell, Lester G............West Buxton
Flagg, Charles F..............Portland
Ford, Albert H, Monument Sq., Portland
French, E. O..................Norway
Gile, Leland H..................Alfred
Hamlin, Simon M........South Portland
Irish, Dr. I. C..............Bowdoinham
Johnson, E. E..............East Hebron
Johnson, James G, 43 West St., Portland
Jordan, Ira...................Milbridge
Kelly Brothers..........Dansville, N. Y.
King, H. P. Monument Sq.,......Portland
Lee, Fred W..................Augusta
McAllister, Mrs. Zaccheus........Lovell
Merrill, Leon S..................Orono
Norcross, Earl S..............Winthrop
Parker, H. D............Livermore Falls
Payne, H. S..................Gardiner
Penney, C. V.............Mechanic Falls
Phinney, Mrs. Charles S.........Standish
Phinney, E. A...........R. F. D., Wilton
Philbrook, E. E., Exchange St., Portland
Philbrook, Walter E.....R.F.D., Dryden
Pierce, A. W..................Woodfords
Pratt, O. M............Plymouth, N. H.
Reynolds, W. E..............Winthrop
Ricker, W. J...................Turner
Rines, J. Henry................Portland
Roberts, John A................Norway
Roberts, Wilton G................Alfred
Rolfe, Percy, 98 State St.,......Portland
Sears, F. C................Amherst, Mass.
Shaw, Ralph W. E...........Sebago Lake
Thompson, A. E...............Intervale
Towle, E. W..........North Vassalboro
Walker, S. L................North Jay
Walker, S. W.............East Dixfield
Washburn, C. C..........Mechanic Falls
Wirckworth, Lucie..............Gorham
Wyman, F. L...............West Paris

Exhibit from orchards of Clement & Taylor, Winthrop, at Annual Meeting, Maine State Pomological Society, Portland, Nov. 2-4, 1915.

ANNUAL MEETING
OF
MAINE STATE POMOLOGICAL SOCIETY

PORTLAND, NOV. 2, 3, 4, 1915.

TUESDAY EVENING, NOVEMBER 2.

Prayer.

ADDRESS OF WELCOME.

HON. WILLIAM M. INGRAHAM, Mayor of Portland.

Mr. Chairman, Ladies and Gentlemen:

It is certainly a great pleasure that I have this evening in welcoming to our fair city the Maine State Pomological Society. It is certainly an organization that deserves the praise and the good will of all the citizens of Maine. We, in fact, thank the society for coming to Portland and placing in our hall such a beautiful exhibit of one of the great industries of Maine, that of apple raising.

Agriculture is certainly one of the main things in this world. It is probably the most important calling, because nearly everything depends on the success of agriculture, upon the success of the farming interests in tilling the soil and bringing the products to us all. And so the State of Maine always has taken a great interest in agriculture and has done all it possibly can to increase and forward any kind of a movement that has had agriculture as its foundation. And today we are here to welcome a society that has for its main object the promotion of the apple industry. Years ago apple growing was a mere incident of farming. The farmer had a few trees on his farm; he gave little attention to them. If anything grew on those trees he gathered it, whatever it might be, fruit of any kind. But that is all changed and the farmer today realizes that the apple is one of his chief products. It is no longer an incident of farming. He makes it a specialty and he has learned that it is one of the very best lines of farming. It is something that demands his attention, and something that in return brings him a good livelihood.

The apple industry has grown to such proportions that it is probably recognized today as one of the chief branches of farming. Throughout our state, wherever we go, we see the great orchards, especially in that section of Maine which is commonly known as the apple belt, running from Turner right up through to Waterville. That great section of Maine is rich in soil and the climate is just right for the production of apples. And so the Maine farmer, particularly in that section, is giving his time and attention to this most important branch of agriculture. It is certainly a most promising thing to see such a change in the State of Maine, because it means so much to our industrial prosperity that this particular branch of agriculture should receive encouragement, and I am sure we are all glad to do everything we can to lend our assistance in promoting the interests of the Maine State Pomological Society.

The apple is one of the most important things for the table. It enters in different forms into a great variety of food. It is prescribed by the physician. I have no doubt that people in considering the advantages of apple raising have thought of these different things, and that it has been a means of stimulating the interest in that particular line of industry. I am sure that it is a very attractive branch of farming. It is something that I, personally, have had a little experience in. I am the possessor of quite an orchard, so I know whereof I speak. I have a real interest in the success of the Maine Pomological Society from personal contact with the work. I know how important it is and I know what it means to this great state. I am very glad indeed to see that the farmer is taking an interest in this line of work, along the proper scientific lines, and it is important that he should do so. The apple industry demands as much thought and attention and skill as that of any other branch of farming. Years ago the farmer, as I have said, paid little attention to his apple crop. Today he gives it his attention by careful pruning, spraying, and cultivation of the land, and he is getting the results, and we find today that the Maine apple is the best in the world. It has no superior, no competitor. If the Maine farmer will only give his attention to the careful and scientific cultivation of the apple, there isn't any doubt in my mind but that he can command the markets of the world. The Maine apple has the flavor; that is the principal thing. It is the apple which people like. The Oregon apple, beautiful to look at—large, fine color, over-cultivated, perhaps, if anything—has not the flavor, and it never can have the flavor of the Maine apple. And in Maine we can, as proven by the exhibits here tonight, produce apples of equal size and beauty, as compared with the Oregon apple or any other, and we have the flavor thrown in, which is the main thing, and you will see that we will command the markets of the world easily when that is known. The Maine apple is reaching a wider and greater market all the time.

The Maine farmer should give very careful attention to the packing of apples. This is one of the most important things. And if he will only do this, put up his apples in a careful and scientific manner, place them on the market in an attractive form, I venture to say there will be no trouble in selling the Maine apple in any market. But the old method of putting a few apples of attractive appearance on top, and a few on the bottom in case the barrel is opened at that end, and filling up with mean ones, has gone by, and any man who would do that ought, at least, to be called to account for such actions. But I think that this old trick has been exploded and it is not practiced any more, and I am glad to know that we have laws in Maine to compel men to pack apples in an honest and scientific way, because that is the proper way to gain the confidence and the patronage of the apple buyer.

I am particularly glad to have this opportunity of greeting the officers of the organization and of congratulating them in carrying on this good line of work. It is something that helps us in the city as much as it helps those in the farming communities who are raising apples for profit. We want their products in the city. We are interested in what they have to sell; because, after all, it is in the city where the product of the farm finds its market. I am sure we all take an interest in the Maine State Pomological Society, and we welcome you to Portland, and we hope that your society will favor us again very soon, in fact we would be glad to see you every year here in Portland. I thank you.

ADDRESS OF WELCOME.

GEORGE L. CROSMAN,

President Chamber of Commerce, Portland.

Ladies and Gentlemen:

I feel that it is a great privilege and honor to be able to second this welcome that has been given you by our Mayor. I cannot add much to what he has already said, but in a few words I would like to give you a very hearty welcome on behalf of the Chamber of Commerce of the city. Portland we call America's sunrise gateway. We call Portland the gateway of Maine, and to Portland we welcome you most heartily. Portland is alive. Portland has recently been put on the map in larger letters than it ever was before. We hear that people are talking about Portland from one end of the country to the other. We propose to keep them talking, and we propose to keep them guessing, to some extent, as to what we are doing down here.

Portland does not mean for any real good thing to go by it. Of the one hundred thousand people in Portland, the Chamber of Commerce is made up of the most wide-awake, most progressive, and most lively bunch of them all. You will notice, please, that I said of the one hundred thousand people in Portland. We have various estimates. Our census says sixty thousand, but we people in Portland do not believe that. A good many of us believe we honestly have seventy thousand—sometimes we try to stretch it to seventy-five thousand. Tonight I have stretched it to one hundred thousand, but I am merely looking forward just a little, and when the Chamber of Commerce has gone on a little further in its activities the one hundred thousand will be here all right. So it is a case of not now but soon.

We know a good thing when we see it, and the Pomological Society we recognize as one of the best things in Maine. Therefore, we welcome you. And we are prepared to give a reason why we so regard you and why we welcome you. Yes, there is a reason. The Chamber of Commerce of Portland is—shall I say it?—the greatest and most intensely in earnest cooperating, municipal, civic body in Maine—cooperating, pulling together, shoulder to shoulder, for the welfare not only of Portland but of the whole state. We believe in cooperation. The day of bickering, petty jealousies, enmity, of self-seeking, hostile rivalry, is fast becoming obsolete. Cooperation, unity of interest and effort, is now recognized as the true basis of prosperity and success. You are cooperating, working together heart and soul, for mutual interests and to build up one of the finest industries of the state. Your success means prosperity for the state. Therefore we welcome you and greet you as coworkers. The Chamber of Commerce welcomes you, because it welcomes all efforts and endeavors to lift standards of production, standards of marketing, standards of doing business, all efforts to put Maine and Maine products in the forefront of our national life and industries.

I want to refer to question 17, contained here in the program, "Should not we as fruit growers produce all the apples which are consumed in the State?" I say to that, absolutely,—yes, and more. We should not only produce all the apples that are needed in the state but we should produce enough more to send them right straight across to the Pacific coast and show the people, as the Mayor has intimated, in California and Oregon, what a real apple looks like. I have been in California, I have seen the apples of California. They are just like the apples of Oregon, according to the Mayor's reference. They are big, fine-looking things on the outside, but inside, why there is plenty of juice but very little flavor and quality from the standpoint of a Maine apple man. They raise great big things on the Pacific coast, and they talk big, and they make a little more noise than we do down here in Maine. I am inclined to think that we make a mistake in not making more noise. Why, bless you! there in California not long ago a farmer came to me and said something about his potato crop and boasted about what nice juicy potatoes they raised in California. Well, now, they do raise nice, juicy potatoes. They raise everything nice and juicy. They irrigate it to death.

Maine raises the finest quality of men, and, if I do say it, many, many states in this nation today are what they are by the enterprise and the brains and the brawn of the men that Maine has sent out to them. There is no reason, friends, why Maine should not raise just as good apples as she raises men, because the men have the brains to produce the apples. And, therefore, we ought to have both men and apples of the very highest and best quality. I noticed in one of the papers the other day about some fruit-growing people out in Kansas sending the President a wedding present of a barrel of apples, and a suggestion was contained in the paper, that I want to second here most heartily, namely, that out of this magnificent exhibit downstairs, the very finest and the best of those apples down there in that hall—this is the suggestion of the paper, not mine, I am merely seconding it and saying go ahead—that the very best and the finest be selected and a barrel be made up and sent to the President as a wedding present from Maine, that he may see, as the papers say, what regular apples are like.

The Chamber of Commerce welcomes you because it stands for enterprise, push and up-to-date methods. You are studying your business. You are striving for perfection of product. Perfection means success. You are making intelligent application of scientific methods to secure best results. That appeals to us, to the Chamber of Commerce. Nothing worth while is ever realized through indifferent, haphazard, lazy, mossback, old fogy methods. We hear much about developing Maine. You are helping to develop Maine by the surest and most practical method that can be devised. Developing Maine is not a hot air process. It is not a hot air job. It is downright, conscientious hard work, developing her resources and earnestly and intelligently using her natural endowments. It is a process of getting by painstaking labor the most and the best products from every available acre of her farm land, from her industrial workshops. The apple surely is a glory to the State of Maine. Go downstairs and see what there is there—great, big, luscious, red-cheeked, crimson, green and golden apples—firm flesh, economic in food value, health giving, hearty and appetizing. Do what you will with your oranges and lemons, your pineapples and your prunes, give me a Maine apple for the all-round satisfaction of a staple fruit. We welcome you because you are cultivating the finest fruit God ever gave to man. We want you to come again.

RESPONSE.

H. L. KEYSER, Greene.

Mr. Mayor, President of the Chamber of Commerce, Ladies and Gentlemen:

On behalf of the Maine Pomological Society I want to thank the Mayor for his cordial words of welcome, and through him and the President of the Chamber of Commerce, to thank them for what they have done and what they are doing.

Three years ago I had the pleasure, as presiding officer of this society, in this building, to advocate two measures to be brought before our coming meeting of the legislature in the following January. One was a greater recognition of this society by the state and the other was a law for the better grading and packing of fruit. At the hearings before the Agricultural Committee at Augusta the committee very easily were convinced that we should have at once a larger increase in our stipend and consequently a better recognition by the state. When it came to a consideration of the other measure, we were opposed, largely from want of proper information and understanding as to what we were advocating, a better grading and packing of fruit, and I refer to this particularly here tonight because at times the clouds were very dark and the outlook was gloomy; but when it came to the day of the second hearing before that committee there was one great sunbeam came before those who were fighting for this measure before the legislature. And that ray was the presence of a large delegation from the Portland Chamber of Commerce. They were not only there to say a good word for us, but I want to say to them tonight that if they had not even said a word before that committee, their very presence at that time was of the greatest help to us and of great assistance in receiving the unanimous report that we did, recommending the passage of that measure before the legislature from the committee. And it was not necessary tonight for the Mayor to extend to us the keys of the city of Portland, because we have been here before, Mr. Mayor, we have enjoyed ourselves, and we have come back. We have been royally entertained here in the past, and we recognize in the grasp of the hand of fellowship, in the smiles which we received, that we are welcome. It requires no extension of the keys of the city. We know that we are among our friends.

The Maine Pomological Society's slogan for many years has been better fruit for Maine. But we have added many more words to that slogan of late years. I mentioned one only a few moments ago, which is the better grading and packing ot fruit. And we are just as deeply interested today in the market question, in the distribution question. I want to say to you that it is no easy task to raise such fruit as you see in the hall below. It requires a very peculiar make-up of man. He must have some knowledge of soil conditions. He must have some knowledge of plant pathology, some knowledge of insect life, and, incidentally, insect death. As it has been said, and well said this evening, there is no man in the world who works in closer partnership with the Almighty than the orchardist. He is next to nature.

I am not here tonight, in this response, to recommend on the part of this Society any radical legislation, but there is one thing that I do want to refer to for just a moment, not that the time is ripe for it, because we are not ready and as I told a gentleman tonight, I want to live in the state a few years longer, I don't want to be driven out yet—it has been mentioned in the past and I mention it, that it may become a question of education—and that is, the enforcement of spraying. It sounds radical. But it is being talked of in other states. And sooner or later the State of Maine must cut down its old disease-infected trees, and Mr. Brown and Mr. Jones who take care of their orchards and spray faithfully and put on the greatest insurance that it is possible to put on, must have that protection from their neighbor who does nothing. The Mayor will tell you, if you build a residence in the city of Portland today that you must put down the sidewalks according to ordinance, that you must make your sewer connection according to law. And there is no reason why the orchardist of the State of Maine should not have protection against his neighbor whom the President of the Chamber of Commerce refers to as the mossback man who won't advance. I do not advocate it tonight as a radical change. I mention it, because all changes of this kind must be talked about, and it takes a long while. It is an educational matter. After a year like this, in which all the elements seemed to be against us, and we have carried out faithfully our whole program and possibly failed, many of us, in the quality of fruit in the last instance, I want to say: Keep up your courage, keep up the fight, do not give up. Just remember those four lines of Kipling—

> "Orchards where I'd ruther be—
> Needn't fence it in for me!—
> Jes' the whole sky overhead,
> And the whole airth underneath."

APPLE GROWING IN VIRGINIA.

S. W. FLETCHER, Fisherville, Va.

(Illustrated Lecture.)

Mr. President, Ladies and Gentlemen of the Society:

I am glad that I do not come here tonight as an utter stranger to New England. I was born in Middlesex county, Massachusetts, and if I am to believe the fragrant memories that come to me now of my boyhood days I was raised mostly on pumpkin pie, doughnuts and Baldwin apples. I have gone far afield since then, across the continent and back, and finally have come to rest in Virginia where I have a home that I love very dearly and an apple orchard that I prize very highly; but as I came through these familiar hills today, the first time in eight years, I realized that however dear is the state of my adoption, it can never be quite as much to me as New England; and however much I may value my Virginia York Imperials and Winesaps, there can be no apple that will taste quite so sweet to me as the New England Baldwin.

I have come not to lecture or to advise, but simply to tell how we are growing apples in Virginia, and perhaps to draw a few lessons which may be applicable here. A good business man learns from his competitors. We in Virginia are your competitors in the apple markets of the world. Over one-half of our apples are exported and come in competition with your Baldwins; and we meet in the markets of Boston and New York.

Location. Virginia apple growers share with you the advantage of a location near the great centers of population. We are equally advantageously located as regards local markets, facilities for the export trade, and cost of transportation. It costs fifty cents to ship a bushel of apples from Oregon or Washington across the country. The opening of the Panama Canal has not, as yet, proved a benefit to our western competitors. It costs me eleven cents to ship a bushel of apples from the Shenandoah Valley of Virginia to New York, and I presume your rates are even less. This difference in freight rates is a nice little profit in itself.

This picture of my farm I use to illustrate a fact that must have been impressed upon you as forcibly as it has upon us,—that we must put our orchards upon the hills and slopes if we are to secure maximum protection from frost. I have had my orchard seven years, and in that time have never lost any considerable part of a crop from frost. Out west they pay twenty-five dollars an acre or more to protect their orchards from frost by the use of smudge pots. How much more practicable it is, and how much it reduces the cost of production, if we have a location that secures frost protection without cost.

Steep land. You will notice that this is a gentle slope. It is not necessary to get steep land in order to secure freedom from frost. We have many orchards in Virginia, particularly on the eastern side of the Blue Ridge, that are on steep mountainland. It is so steep that those mules are having a hard time sticking on it. They are hauling down six barrels of apples on a sled and like as not the sled will get away from them and turn over. Apples were planted on these very steep sites in order to take advantage of the black mountain soil known as the Porter black loam—an excellent apple soil. But I contend that one is not justified in growing apples on such steep land, even to secure immunity from frost and favorable soil. It is almost impossible to do a thorough job of spraying on such land, and the cost of all the orchard operations is increased so that it greatly increases the cost of producing apples. Undoubtedly the time will come when our population will be so dense that we will be obliged to use these steep hillsides for apples, but not now. We can get good apple land, reasonably free from frost, on moderate slopes.

Distance from shipping point. This picture shows the hauling of apples to one of the depots in Virginia from orchards twenty miles away. The distance of the orchard from the shipping point is a vital matter. When apples were selling for six and seven dollars a barrel net to the grower, as they did in years past, growers could afford to haul them twenty miles to the depot. Now the time has come where the man who makes money in apples must produce them at the lowest possible cost of production, like any other business man. He cannot afford to haul a load of ten or twelve barrels of apples twenty miles to the cars at a cost of forty cents a barrel, as some of our fruit growers have done. These people will be gradually forced out of the apple market. Personally I would not make an investment in an apple proposition which is over six miles from the shipping point and which does not have reasonably good roads to the depot.

This shows one of our typical apple soils, the Hagerstown stony loam. You can see the flinty limestone fragments on the surface. There is a red clay subsoil about twelve inches below the surface. I do not care so much what the surface soil is, if only there is a strong clay sub-soil. The more gravel or chirk in the surface soil the better; it acts as a mulch on top of the land, making it less subject to drought.

This picture taken on my farm five years ago shows a crop of corn that will hardly average five bushels to the acre. The next picture shows the same field as it is today, with a promising young orchard on it. These two pictures illustrate this point that land may be utterly worthless for general farm crops and still be excellent for fruit. My farm is on Barren Ridge; it was so named a hundred years ago by the Pennsylvania Dutch farmers who settled that country, because it would not produce good corn and grass, so they thought it was worthless. Now it is worth twice as much per acre as their rich farm land, because it will raise apples. Some time every soil, even those we now consider barren, will find its sphere of usefulness.

Planting. Here are one, two and three year old trees. I always have preferred a one year old tree provided I could get them at least four feet high and stout; then the head may be formed at the desired height. Moreover, they will come into bearing just as early as two year old trees.

Cropping the young orchard. My method of caring for the young trees possibly is somewhat different from yours. You have heard it advised that a sown crop should never be grown between young apple trees—always grow a cultivated crop, like potatoes or corn. That is right if it is feasible; but I have found that the most practicable method for my conditions is to grow the standard farm rotation of corn, wheat and grass between the young trees. That does not mean, however, that those crops are grown close to the trees so that the trees receive no cultivation. A strip of uncropped land five feet wide is left each side of the row of trees, the year the trees are set out, and that is kept harrowed. The next year this strip is widened to six feet, the following to seven feet, and so on. Starting with corn when the trees are set, the rotation comes back to corn by the time the trees are ready to take full possession of the land, when they are five or six years old. For our conditions we find this method more practicable than growing potatoes or any other cultivated crop between the rows. Some of you may think this is heresy; no doubt it is for your conditions, but not for mine.

Tillage or sod. Fifty years ago almost all apple orchards were in sod. Then came the tillage propaganda, which was derived chiefly from California. We were told that all apple orchards should be cultivated, and some intimated that the man who did not cultivate his apple orchard was either a fool or a knave; no exceptions were made. This was a swing of the pendulum to the other extreme. We are coming now, I think, to see that there are conditions when tillage of mature bearing apple orchards may not be as desirable as some other method of soil management. I suppose that eighty per cent of Virginia orchards are cultivated, but there are a large number of exceptions. One of these is shown here—a profitable young orchard of York Imperial, on land so rocky that it would try the patience of Job to attempt to plow it. We have many profitable orchards on land of that type.

A second occasion when tillage is not practicable is shown here; the land is so steep that if it were plowed and cultivated it would wash to pieces in a few years. Our Southern hillsides erode very quickly. On thousands of acres of the most profitable apple orchards in Virginia the scythe is the only practicable implement of tillage. Perhaps red clover seed is scattered every two or three years and the aim is to get as much herbage to grow as possible. The grass, weeds and sprouts are cut at least twice a year and left on the ground as a mulch. On strong land this method produces excellent results.

A third exception is shown here—an orchard on very rich, moist land. That is one of our famous Albemarle Pippin orchards, lying in one of the coves on the eastern slope of the Blue Ridge. The soil is naturally sub-watered from springs on the Ridge above, and is rich, deep and moist. To plow and cultivate such an orchard would make it grow too luxuriantly and favor blight. These cove orchards on "pippin land" are some of the most profitable in Virginia and they are seldom tilled. So there are these exceptions in Virginia when tillage is not as practicable as some other method, and there may be some in Maine.

Mulching and pasturing the orchard. If the mature orchard is to be left in sod there are two ways of handling it—by mulching and by pasturing. In mulching, the grass and herbage is cut and left on the ground, which is fertilized so as to get as much of a growth of herbage as possible. A supplemental mulch of straw is sometimes brought in to make a still heavier mulch around the trees. We rarely use that in Virginia; straw costs too much. The more common method is shown here, which is in my York Imperial block, where the grass is simply cut with the mowing machine two or three times a year and is left to lie in the orchard.

If the land is not mowed it can be pastured. In many cases sheep are the most useful animals for this purpose, since they keep the weeds down and the herbage cut close. They do not let the ground get filthy with weeds, and they do not browse the limbs as high as cattle. Hogs are used to some extent, and are very useful for that purpose. Cattle are very hard on apple orchards, as you know. Sometimes calves and young cattle are allowed to run in orchards, as shown here, but you can see how high they browse the limbs. They are heavier than sheep and hogs and compact the soil, and altogether are not desirable in the orchard. We have many profitable sheep and hog pastured orchards in Virginia, especially on the stronger lands. I am not advocating that Maine apple growers should follow these methods. I am simply saying there are conditions in Virginia where they have proved successful.

Orchard tillage. If the orchard is to be tilled, plowing should be done early for several reasons. When plowing is delayed and there is freshly turned ground under the trees when they are in bloom, there is more danger of frost killing the blossoms. Again, by that time the annual feeding roots of the trees have begun to grow and there is more or less injury by plowing, especially if it is deep. If plowing is done when the trees are dormant there is no injury. We plow not later than March, if we can help it. I do not use a plow in the older orchards but a disc harrow. Disking so as to cut out not more than four or five inches deep gives us equal results as deep plowing with a two-horse plow.

After plowing or disking, we use the spring-tooth cultivator, which is our standard implement for summer tillage. What is good tillage in an apple orchard? We are advised by most people to harrow the apple orchard every week or ten days. I think we should emphasize more than we do the fact that on certain soils, which are naturally retentive of water, harrowing once in three weeks may be as effective in conserving moisture as harrowing every week on other types of soil. "Good tillage" may be once a month or once a week, according to conditions. It is a personal problem for each grower.

Forming the head. I suppose there never have been two fruit growers who have agreed on all points in the pruning of apple trees; so I shall merely tell you how I prune and why. This shows a tree after it has made its first season's growth in the orchard. The next picture shows this tree is pruned. I use the modified central shaft system; that is, the leader is preserved for two or three years. I usually leave three or four limbs the first year, including the leader. All are cut back heavily, the leader being left about a foot longer than the others. The second year another whorl of limbs comes out from the tip of this leader, making two sets of limbs on the trunk. Then I take the leader out and cut back the others. Thereafter the pruning consists simply of thinning out.

I prefer the modified central shaft, taking the leader out after the second year, because it gives eight or nine limbs to bear the weight of fruit instead of three or four. When all the fruit is borne on three or four limbs, as in the open center system, the strain all comes on a very small part of the trunk and splitting is likely to result. We must remember that our wood is more brittle than it is in the west where the open center method is practiced to advantage. They can develop their best fruit by cutting out the center, and the trees do not break, but subject our trees in Virginia to the same weight of fruit and they will break. We have had too much copying of western methods, just because they were successful there, not only in the care of the trees, but also in the packing of the fruit. We must remember how different our conditions are, and develop a practice that fits our own conditions.

This shows an apple tree in the famous Vergon sod mulch orchard of Ohio. I want you to notice what an immense amount of bearing surface it presents. The unit of production in an apple orchard is the amount of bearing surface, not the number of trees. This one tree has as much bearing surface, or potential ability to produce apples, as half a dozen badly crowded trees. This tree is an argument for wide setting, which is forty feet apart with us. It is also an argument for the use of every device and art in pruning to keep the tree low. Some varieties, however, you cannot keep low, as they tend strongly to take an upright form.

Pruning bearing trees. This shows part of my bearing orchard in the winter, after being pruned; it shows how thin I try to keep the tops. There is a good old Methodist hymn it would be well to sing or to whistle while pruning:

"Clear the darkened windows,
Open wide the doors,
Let a little sunshine in."

Sunshine makes color in apples—not potash nor any other kind of fertilizer, but sunshine and the degree of maturity. The more sunshine around the apples, the redder they will be. As our grading laws become more stringent, color will count more in the selling value of apples.

Here is a tree top in which there is a constant struggle for life between the different limbs. You cannot expect good apples when the limbs are cramped by their neighbors. Neither can you expect a long lived tree when the wounds are unpainted and unhealed; the tree soon becomes rotten-hearted. This picture illustrates what follows when pruning is neglected for several years and then all the surplus limbs that have been accumulating are cut out at one time; you get a forest of water sprouts. Here are some safe rules: Cut back young trees heavily the first two years, to make them stocky and branch low, and cut out all but the scaffold limbs. After this let the pruning consist merely of thinning out. Never prune bearing trees heavily any one year unless they are very weak. Prune lightly, every year, so as not to upset the bearing habit.

Spraying machinery. In spraying, our problems are very similar to yours. I prefer the gasoline spray outfit for ordinary work. The compressed air outfit is used on the steeper land. This is a picture of the old type, one tank being for air and the other for liquid, to be charged at a central loading station. This is open to the grave objection that you are obliged to make long trips back and forth to the loading point to charge the tank. The new type of compressed air outfit, in which the compressor and engine are mounted on the wagon with the spray tank, is much superior. It marks the greatest advance in spraying machinery in recent years; though I would not say that it is better than a good gasoline outfit.

There is one, and only one, real hurry up time in apple growing, when the job has to be done on the minute; that is the spraying when the blossoms fall. We must get our poison in the calyx cups within a week or even less or it will be too late. This means that the spraying radius of an outfit is limited. We used to spray forty or fifty acres with one power outfit; now we believe that twenty acres of full bearing trees is nearly the maximum for one power outfit. It will help a great deal if we can pipe water to all parts of the orchard. We can then distribute the concentrated lime-sulphur solution where water is available and not go out of the orchard to load. This picture shows water piped from a spring on the hillside above the orchard. By this method the spraying radius of a machine is practically doubled and the cost reduced.

Insects and diseases. In Virginia, as in Maine, I presume, the codling moth is the greatest apple pest, not even excepting the San Jose scale. It causes more loss in Virginia than all other pests together, in spite of all our efforts. I have come to the conclusion, after four years' trial, that I will not use the dry lead any longer, because it does not seem to have the sticking properties of the paste lead. It may be all right in Maine, where there is no large second brood of moth, but we have two strong broods, emerging at different periods, and must have a poison that will stick all summer on the leaves and fruit, and the paste does this better than the powder.

If we wish to have fruit next year we must make fruit buds this year—big, fat ones. We can see them in the axils of the leaves in August, if there are healthy leaves around the bud. Protection of the foliage from disease is fully as important as protection of the fruit. In Virginia many neglected apple trees are defoliated by the cedar rust. Part of the life of this disease is passed on the red cedar and part on the apple, where it disfigures both leaves and fruit. Spraying helps if done at exactly the right time, but the most effective method is to cut down all the cedars within half a mile of the orchard. Stringent measures have been taken in the apple sections of Virginia to cut down all the red cedars in the neighborhood. At Winchester, Virginia, the banks refused to loan money to any man who had red cedars on his place which were a menace to neighboring orchards. They justified themselves in this way: "Apple growing is the chief industry of this county. We get our money from the men who grow apples. If we are going to stand in the way of their making money from apples, we do not care to accommodate you." We now have a state law under which any apple grower whose neighbor has red cedar trees that are injuring his orchard he can get them cut down by protesting to the proper authorities. It has been declared constitutional, and is working to the interest of the apple industry.

Some of you may have nursery stock come with the woolly aphis and crown gall upon the roots. These have proved to be very serious pests in Virginia. Right in the prime of their life, as seems to us, the trees begin to die and on pulling them up we find it due to woolly aphis or crown gall that was on the nursery stock when it was planted. If you do not have, you should have, very strict regulatory measures concerning these pests.

There are some apple diseases in Virginia which we cannot control by spraying: This "brown spot" is one. It attacks the York Imperial most of all, and is apparently the same as your "Baldwin spot." This year I presume we lost 30 per cent of No. 1 York Imperial apples by the brown spot. It is what botanists call a physiological disease, which means that it is a case of plant indigestion. Apparently it is associated with an excess of nitrogen in the soil or an excessive vegetative growth of the tree. We find spot most abundant on young trees that are growing very fast. We also find it in orchards that are heavily fertilized, and on trees that are not heavily loaded. It helps to control the spot on the York to grow the trees slowly, and not over-stimulate them by too much tillage or heavy fertilizing. If we allow the tree to load heavily, instead of thinning them out, there will be much less spot.

Here is an apple which is perfect and another which has been disfigured, dwarfed and russetted by spraying with Bordeaux mixture. Practically no Bordeaux is used in Virginia now except in late summer sprayings for bitter rot. The introduction of the lime sulphur solution for summer spraying has greatly simplified orchard spraying. It was tedious to make and apply Bordeaux. The introduction of lime sulphur as a summer spray has caused more people to spray than would have been possible had Bordeaux remained our standard summer spray.

Thinning. I have not been able to get old apple trees to bear every year by thinning and I have been trying six years. Old trees are set in their ways. I do not doubt young trees can be made to bear pretty regularly by thinning, but trees which have had their own way for twenty years, bearing alternate years, as most of our Yorks do, cannot be made to bear every year, except with great difficulty.

There are two things to keep in mind in thinning. One is to thin enough so that you get a grade of apples two and one-half to three inches in diameter; very large apples are not as desirable as they do not store as well; thin to secure size and color. The other is to thin so that the limbs will not break. How much more it will pay to thin I do not know. I do know that with the York Imperial, which is much subject to brown spot, the more you thin the more spot you have; I have abandoned the thinning of the York Imperial, except weak trees and those that are excessively loaded. The Winesap, on the other hand, can be thinned to advantage. York Imperials loaded heavily make first-class storage stock, free from brown spot, but if thinned to eight inches apart, as advised in the west, the result is likely to be over-grown, punky and spotted fruit. It depends on the variety and the conditions.

Harvesting. This is the old way of packing apples and still the most common method, by running them over the table in the orchard. It is open to the serious objection that the fruit and the men are exposed to the weather. We often have hot days at harvest and the apples go into the barrel warm. It takes a long time to cool them down in storage. Our growers are coming to prefer the central packing house in the orchard.

This is one of my teams hauling apples to the packing shed. They are picked in half-bushel willow baskets and not shifted until dumped upon the packing table. I prefer these baskets to boxes because the less apples are handled the better. Moreover, willow baskets can be tossed around without breaking; boxes have to be handled carefully. The baskets are carried to the packing shed on a wagon holding one hundred baskets, so I can take seventeen barrels of apples to the packing shed each trip if necessary.

Sizing Machine. My packing shed for a forty-acre bearing orchard is about fifty by thirty feet. The sizing machine is run by the gasoline engine taken off the spray pump. I can say after three years' trial, that I can put up apples cheaper and better in the packing shed than running them over the table in the orchard. I thought it would cost more, but I find that unless the haul to the shed is over half a mile, I can put them up cheaper. The men are more comfortable, and the machinery in motion keeps them spurred up to their work. I get more work out of them and they do it better.

The next picture shows the machine that I have used for three years—the Schellenger. It is expensive, costing $225, but I think it does better work than any other. There are cheaper machines on the market, however, which do good work. The sizing is done without the slightest bruising. The advantage of the sizing machine is that the packer does not have to think about size at all; he has only to think of color and blemishes. That means he can do a much better job of grading.

Apples of a size. Instead of packing apples 2 1-2 inches up, we pack 2 1-2 inches to 3 inches, and 3 inches up. This gives a much more attractive pack, and there is a gain in bulk as well. Take a thousand barrels of apples packed 2 1-2 inches up and divide them into several sizes, differing by a quarter of an inch, and they will pack out 1,025 barrels, perhaps 1,050 barrels, since there is more space between apples. From every point of view that is all right; we are giving the buyer a good deal and we get more quantity.

This shows the Hasdil sizer which is used considerably in Virginia and costs about $125. I think it has not the capacity of the Schellenger. We ordinarily run 250 barrels a day through our machine; but sometimes as many as 325 barrels.

Apple packages. For the special or personal market, the box pack is all right, but there is a limit to the amount of the box apples that can be handled to advantage. In Virginia there are fewer apples boxed now than five years ago. The past four years Virginia apples have paid better in barrels than in boxes. I shall not box except special varieties like the Mother. We are catering to the wholesale trade and most of our apples had much better be in barrels. Until a grower can produce around 90 per cent of his crop fancy stock he had better let box packing alone.

We have our troubles with labor, as I suppose you do. A large part of the local help available is not altogether dependable. I have found it necessary in handling a large orchard, packing an average of 4,000 barrels each year, to have dependable help, so I get a force of men from elsewhere and camp them on the farm. Then whether you want to work one hour or ten hours, they are on hand. I find it is the best solution of the labor problem.

One end of the packing shed is used as a cooper shop. Some years it is hard to get apple barrels. Occasionally we have had to hang around the cooper shop until nine o'clock at night, waiting for a chance to get barrels. Two years ago I decided I had done enough of that. Now I get the stock in car lots and make my own barrels. This year I ordered cooperage stock for four thousand barrels. It cost me twenty-two cents a barrel laid down at Fisherville, and it cost five cents a barrel to make, so the barrel cost me twenty-seven cents. These barrels were just as good as those sold by the local cooper shop for thirty-seven cents. This ten cents saved is worth just as much as getting ten cents a barrel more for the apples. One of the advantages of large operations is that you can save in these ways.

I have found that it costs me, one year and another, with seven years' records available to date, $1.15 to grow a barrel of York or Ben Davis apples and put on board the cars. The average selling price has been $2.65 f. o. b., Fisherville, the last seven years. This may not seem large to you, but remember it is wholesale apple growing. This gives a fair margin of profit; if I can do as well as that in the years to come I shall be satisfied. But the boom days, when everybody was excited and putting out apple orchards, are over. You will not find twenty acres of young apple orchard at Hood River selling for $20,000 now. That was a purely speculative value, a real estate value, not based on the actual income from the fruit itself over a long series of years. There are men who are going to get discouraged and quit. These men will draw a long face and tell you there is no money in growing apples. But there are other men who will stay with the business year in and year out, who will not accept as the final verdict on the profit in apple growing the returns of any one year or two years, but who are in the business for a lifetime, and who propose to stay with it through fat years and lean years, These men will be in a position to take advantage of years of good prices like 1915. Last year we could hardly get $1.75 a barrel for apples; many were discouraged, and some even pulled out the young orchards. This year apples are bringing from $3 to $3.50 a barrel.

A man who goes into apple growing as a business proposition should make a good living from it. But the man who goes into it on a speculative basis only, as a get-rich-quick proposition, will be disappointed.

There are over a hundred varieties of apples grown in America that are of large commercial importance. Tonight I wish to pay tribute to one that stands near the head in the amount of money that it has put into the pockets of apple growers. I would take off my hat to the New England Baldwin.

WEDNESDAY MORNING.

ADDRESS OF PRESIDENT.

W. H. CONANT, Buckfield.

Ladies and Gentlemen:

Another year has rolled around and we are again gathered in annual session and, in behalf of the officers and members of this society, I want to thank the Portland Chamber of Commerce and the citizens of Portland for their untiring efforts and generosity which assured the success of this meeting.

We are gathered here today to review briefly the past, and to consider present and future problems of vital importance to the fruit industry of the state.

The year 1915 will go down in history as the most unfavorable season for the fruit grower recorded in recent years. The spring opened full of promise and, with nearly a normal bloom and a good set of fruit, the prospects were favorable for a fair crop; but our hopes were soon blighted, for, on June 3, came a heavy frost which ruined fifty per cent of the young fruit then set and unfavorable weather conditions which prevailed through the growing season have reduced the crop to about twenty per cent of a normal yield. Yet, with all the extremely wet and unfavorable weather conditions under which fruit has grown, there is little evidence of apple scab. Especially is this true where thorough spraying has been practiced.

A large amount of injury has been done to fruit the past season by insect pests—such as the apple worm, bud-moth, apple maggot, aphis and tarnished plant bug—a large percentage of which can be controlled by thorough and intelligent spraying.

Every orchardist should make a careful study of the life history of these orchard pests and use his best efforts to control them, thereby increasing the yield and improving the quality of the fruit produced.

The storage problem is an important one with every commercial orchardist.

What is the most economical storage?

To what advantage is cold storage?

How can we prevent storage scald?

What varieties should be stored?

Would a pre-cooling plant at shipping points be a paying proposition?

Such important questions are continually coming up in seasons of large crops.

An appropriation was asked for, at the last session of the legislature, to provide an experimental storage plant at Highmoor Farm, believing that much valuable information could be secured by our experiment station on this important subject. The measure was poorly supported and, consequently, was defeated. Nevertheless, the subject is a live one, on which I hope we may have a free discussion by the members of this society during these sessions.

I want to call your attention to the fact that through the organized effort of this society the yield and quality of the

Maine apple shows wonderful improvement. An apple-grading-and-packing law has been enacted, standardizing the products of the Maine orchard, and has raised the standard of Maine fruit in the markets of the world.

Now the next all-important step is cooperation, or business organization in marketing and distribution. Under present methods of marketing, there is too much fruit concentrated on certain large markets which soon become congested, resulting in a tremendous loss to the grower or shipper.

Without doubt this is the greatest problem facing the fruit growers of New England today, and I certainly believe the first step looking to a solution of this problem is cooperation, and on no other basis can a satisfactory system be worked out. But with live fruit growers' associations in all the larger apple-producing districts, affiliated with a central exchange, a system of distribution could be worked out that would spell "success" to the fruit industry of Maine.

Fruit growing is becoming a business and, in making up the program for this meeting, subjects have been chosen which represent the business or commercial side of orcharding.

On account of the extremely busy season at which our annual meeting is held, a small percentage of our members are able to attend. I would, therefore, recommend for your consideration the advisability of holding our fruit show in November, as in the past, and the annual meeting and lecture course in January, at some railroad center, when it would be possible to have a much larger attendance and a more satisfactory program could be arranged for a meeting at this time.

I would also recommend that a greater effort be put forth to secure an earlier publication of the annual report. The valuable information and important data gathered at these meetings on such timely subjects as orchard management and spraying should be published, either in annual report or bulletin form and mailed to every member by April first, or before their orchard operations commence, as, under our present system, much of this valuable data becomes ancient history before it reaches the hands of the growers.

As this closes my two years as president of this society, I want to thank the officers and members for the loyal support given me at all times, and all who have contributed in even the smallest degree to the success of my administration. I sincerely hope the same spirit of cooperation that has prevailed in the past will be accorded my successor, and I pledge my hearty support in all his efforts to build up the fruit interests of Maine.

SPRAYING TO CONTROL INSECTS IN THE APPLE ORCHARD.

G. E. SANDERS, Field Officer for Nova Scotia,

Dominion Entomological Branch, Annapolis Royal, N. S.

In talking on the control of insects in Maine apple orchards I am not, of course, never having been a resident of Maine, in a position to map out a complete iron-clad spray calendar. I have worked on the life histories of several of your insects found in Nova Scotia, Ontario and Illinois. Conditions in Nova Scotia are probably more nearly like Maine conditions than either of the other two, and on a number of your insects I can possibly give you some information. In an apple orchard we have a number of things to consider—fertilizing, pruning, frost protection, spraying, thinning, cultivation, etc. It is almost impossible to say, offhand, which of these is most important in any one locality. The more I see of orchards in various localities the more I am impressed with the fact that each and every problem, to give the result its greatest value, must be worked out locally and its importance, in comparison with others, weighed locally. For instance, in my home province, Nova Scotia, a man can do pretty nearly anything he wants, or neglect almost anything; but if he sprays thoroughly he can depend on paying crops of fruit. I can show you orchards that have never been pruned, others that have never been fertilized, others never cultivated, etc.; but in every case, if the orchards have been sprayed thoroughly, the owner is making money out of his fruit. But I know of no orchard, no matter how well cared for otherwise, that is paying where spraying is not practiced. Last July, my good friend, Mr. Yeaton, your agricultural agent in Oxford county, drove with me through nearly 100 miles of your orchards, and I must say that Mr. Yeaton is doing work in Oxford county that deserves the highest commendation. While on that drive I was impressed with the importance of cultivation, or the conserving of soil moisture and the importance of frost protection, as well as the value of spraying. But as the other two are out of my province I shall confine myself to spraying only.

In spraying for insects we try to arrange our sprays so as to coincide with the sprays for fungous diseases and so make one application do for both. Mr. Yeaton tells me that you, as a rule, apply three sprays in your best orchards; the first, dormant, for blister mite; the second, pink bud for blackscab; the third, immediately after the blossoms for codling moth. The two sprays, one before and one after the blossoms, are, above all others, the two that control the spring insects on the orchard and are the two that we depend upon in Nova Scotia to pay about twice over for all of the four or five sprays that we apply in insect control alone. Then, if it is a wet season and black spot is bad, our profits from controlling black spot may be added to the hundred per cent that we have already made in controlling insects; in other words, the insurance against black spot, which sometimes spoils 80 to 90 per cent of some varieties, we regard as absolutely free. We have paid twice over for our spray in insect control. The extent to which this is true in Maine orchards of course depends upon the number of insects present; and, before going further along this line, I shall go into the life histories of some of your most important insects.

Your President, Mr. Conant, and Mr. Yeaton have asked me to take up the following insects which they consider important. in the order named: Codling moth, bud-moth, fruit or apple worm, tent caterpillar, canker worm, oyster shell scale, San Jose scale, fall webworm, red humped caterpillar, yellow necked caterpillar and tussock moth.

Codling Moth.

This is the insect that causes the ordinary wormy apple. It passes the winter as a larvæ in a fine cocoon under the rough bark of trees, in boxes about packing houses, etc. In the spring it pupates and about the time the blossoms open the first adults emerge and begin depositing their eggs on the apple leaves—the eggs are very small silvery scales, deposited on either side of the leaf. After the blossoms fall a number of eggs are deposited on the young fruit, but the majority are deposited on the leaves and a large proportion of the young larvae feed extensively on the leaves before entering the fruit. Often they enter the fruit at the blossom end before the calyx cup closes and entomologists for years have dilated on the importance of getting the calyx lobes filled with poison before the calyx cups close.

According to Siegler and Simanton, in Bulletin 252 of the United States Bureau of Entomology, from one to two per cent only of the first brood of codling moth in Maine pupaes to form a second brood. So the second brood is of no importance, where the spring brood is controlled. The spray recommended for codling moth is lead arsenate, two to three pounds to 50 gallons of water, applied as soon as the blossoms fall. This spray properly applied will control some 95 per cent of the codling moth, under ordinary conditions.

Another spray which I have seen recommended, but which I found controlled over 70 per cent of the codling moth in Nova Scotia, is that applied immediately before the blossoms. The fact that this spray controls so much codling moth shows that the codling moth feeds on the foliage to a much greater extent than we ever suspected. It also shows us that if we are to get the maximum control of codling moth we must apply a poison spray immediately before as well as immediately after the blossoms.

The codling moth in Nova Scotia has demonstrated to us in a most striking manner the injury which our neighbors are doing us by not spraying, as well as the benefit that they get free from our spraying. When I can first remember, twenty years ago, the codling moth was the principal insect pest of the Annapolis Valley. At that time only an occasional orchard was sprayed. At the present time 87 per cent of the orchards in Kings county and 63 per cent of the orchards in Annapolis county are sprayed and in my five years' work there I have never seen over five per cent of the apples from an unsprayed orchard infested with codling moth, while in the sprayed orchards we often get only one wormy apple in five thousand; at the same time, in Queens county, where there are some large orchards and practically none of them sprayed, the codling moth will often infest 30, 40 or even 50 per cent of the crop. This shows us conclusively that when we spray we control a lot of codling moth for our neighbors who do not spray, and, conversely, they breed a lot of codling moth to fly into our orchards and reduce the efficiency of our sprays.

Bud-moth.

This insect, Mr. Yeaton tells me, has done you more damage during the past season than all of your other insects combined and therefore merits very serious consideration.

The life history is as follows: The adult, a very small, ashy gray moth, flies during July and deposits its small silvery scale-like eggs, singly, on the under surface of the leaf. In about two weeks the young larvae emerge and crawl to the midrib on the nearest large vein and there eat their way into the tissue of the leaf, feeding up to the top row of cells, leaving only a tissue on the upper side of the leaf; while on the under side it spins a silken web, incorporating into this the downy hairs of the under surface. If two leaves touch each other the young larvae will tie the two together and feed off the surface of each or, if the leaf touches an apple, the bud-moth will tie the leaf to the apple and feed off the surface of both the leaf and the apple, eating through the skin and spoiling the keeping qualities even more than black spot. As a rule, from one to three apples are injured in this way in the fall for every ten per cent of the buds infested with bud-moth the previous spring.

About the time the first killing frosts occur, the young bud-moth larvae, for the most part now in the third stage, crawl back the petiole and select crevices in the fruit spurs, often under old budscales, and there form cocoons in which to pass the winter. When the buds swell in the spring the young bud-moth larvæ emerge from their winter cocoons and bore into the tips of the open buds. As the bud opens and the leaves unfold the bud-moth selects one leaf and feeds on it, usually killing it and later, crawls out and ties down another and another as the season goes on. As a rule, it does extensive damage to the blossoms but very seldom prevents bloom, absolutely, in a bud. From our observations, about 35 per cent of the blossoms in the buds infested are noticeably injured, but the real injury is more extensive as we have proved, amounting to from 75 to 80 per cent reduction in set in the blossom clusters infested with bud-moth.

In one case, on Wagners we found 1,205 apples set in 1,000 blossom clusters free from bud-moth, while in 1,000 clusters infested with bud-moth we found only 305 apples set. In another observation on Wagners, we found 223 apples set in 100 blossom clusters free from bud-moth, while in 100 clusters infested with bud-moth we found only 45 apples set. As over 90 per cent of the buds in this last orchard were infested with bud-moth, you can see that the set of fruit in it was reduced by 78 per cent on account of bud-moth. About two or three weeks after the blossoms fall the bud-moth pupates in the cluster of dead leaves that it has gathered about itself and in three or four weeks emerges an adult moth, to deposit its eggs for the next year's brood.

Some varieties are much more heavily infested than others. Crinkly twigged trees, such as Ribston Pippin, Early William, Wagner and Nonpareil, invariably have more bud-moth in them than clean-limbed trees, such as Northern Spy, Ben Davis, Stark, etc. The difference seems to be accounted for by the fact that the crinkly twigs offer better hibernating quarters for the young larvae.

CONTROLS.

The bud-moth has proved one of our most difficult insects to control. In orchards that have been carefully sprayed for a number of years we find, often, only one or two buds infested in a thousand. In other orchards, unsprayed or carelessly sprayed or even well sprayed for only one or two years previous, we often find infestation ranging from 20 to 95 per cent of the buds infested. I know of no method whereby a man can entirely rid his orchard of bud-moth in one year, but I can guarantee that thorough spraying, followed for a few years, the infestation will be cut to at least one-half of one per cent.

We found the spray formerly recommended for bud-moth, applied when the buds are swelling, to be practically worthless as a control. We also found that a spray applied from one to five days before the blossoms open would control more bud-moth than any other spray we could find. This is accounted for by the fact that the larvae, after the bud unfolds, is constantly tying down new leaves and, if we have these young leaves coated with poison before they are tied down, the larvae feeding on them will be poisoned. We also find that the codling moth spray, applied immediately after the blossoms, controls a large number of bud-moths.

This year we tested the new Friend drive nozzle, at a pressure of 200 to 225 pounds, on bud-moth and we found that the coarse driving spray produced by this nozzle increased our control of bud-moth immensely. Where we used the same solution, under the same pressure and on the same varieties, once before the blossoms, with a nozzle of the ordinary misty or Whirlpool type, we got 51 apples set in 100 blossom clusters. Where we used the drive nozzle, we got 122 apples set in 100 blossom clusters infested with bud-moth. A large proportion of this increased set proved false, as would be expected, since the cluster was weakened to a certain extent by the work of the bud-moth before the spray was applied. The amount of fruit picked has not shown this difference, partly due to conditions which entered into the experiment later in the season, so nullifying the result of the drive nozzle on the bud-moth. But the difference in set, taken ten days after the blossoms fell, demonstrates the superiority of the drive nozzle over all others in bud-moth control.

This year, for the first time, we tried some of the powdered arsenate of lime against arsenate of lead, on the bud-moth, with gratifying results. We found that it killed more bud-moths and also killed them more quickly than the arsenate of lead. For a heavy infestation of bud-moth, I would, therefore, recommend the use of the drive nozzle with a pressure of 200 to 225 pounds from one to five days before the blossoms, using as a poison two and one-half to three pounds of arsenate of lead or three-fourths of a pound of arsenate of lime to 50 gallons. If the infestation is bad, use the drive nozzle for the bud-moth spray; if less than 15 to 20 buds per hundred are infested, the ordinary nozzle will do enough effective work. A person can cover a tree more quickly with the ordinary nozzle, so the drive might only be used for serious outbreaks of bud-moth.

Fruit and Apple Worm.

This insect is sometimes referred to as the green apple worm and is the insect that bites holes in the young apple from the time it sets until it is as large as a walnut, causing a portion of the fruit to drop to the ground, the remainder of the holes healing out to form rough scars on the fruit. There are several species, almost a dozen in Eastern America, which do this damage, mostly belonging to the Genus Xylina. In New York state, X. antennata and X. lacticinera are the most common. In Nova Scotia, X. bethunei is the principal species, although we have most of the others. The life histories and habits of all the species are similar. Passing the winter as an adult, they come out in the spring and, after flying for two or three weeks, they deposit their eggs, just when the buds are bursting, singiy on the under side of the outer tips of the apple twigs, about one inch back from the tip. In about seventeen days, or just before the blossoms open, the eggs hatch and the young larvae emerge and feed on the apple leaves for almost two weeks before attacking the fruit; and it is right here that we have our best opportunity to combat the fruit worm—when it is eating the greatest amount of surface for a meal and when it is still a very young larvae.

After the blossoms fall the larvae begins to feed on the fruit, eating holes into the side, and it becomes very hard to poison as it eats so little surface at each meal and, being a large caterpillar, it takes more poison to kill it. A certain proportion of the holes eaten into the apples heal out and form scars on the surface of the picked fruit. A large proportion of the apples eaten into, 72 per cent by actual count, drop as a result of the injury; so, for every three apples you pick which have been eaten into by the fruit worm, you can reckon that seven have dropped to the ground as a result of that injury. About four or five weeks after the blossoms fall the fruit worm drops to the ground and pupates about one or two inches below the surface and emerges as an adult in September, flies about until winter and hibernates under rubbish.

The two sprays which are effective in fruit worm control are the one immediately before the blossoms open and the one immediately after the blossoms fall. We get from 60 to 75 per cent reduction in fruit worm injury in Nova Scotia from these two sprays.

The fruit worm adults are among our strongest flying moths and flying for such a long period in the fall and spring, we would expect the wind to be a great factor in the distribution of this insect. In examining various orchards we find this to be the case. We find wind-swept orchards, as a rule, fairly free from this pest; while orchards protected in hollows by hedges, etc., where moths blow in but do not blow out, are invariably most heavily infested.

Tent Caterpillar and Canker Worm.

These two insects I shall take up together, as a good orchardist would consider them as jokes rather than as serious pests. They put me in mind of the old Irishwoman who said that "Willy was the best natured one in the whole family, if you only gave him his own way." So these two insects are the most easily controlled insects in the orchard, if a person only sprays properly and at the right time. Orchards that are sprayed regularly from one to five days before the blossoms with the ordinary strength of poison will become badly infested with either of these insects. If, by any chance, you have an orchard badly infested with tent caterpillar and you think it will cause serious defoliation before your regular spray goes on, spray just as soon as they have all hatched, that is, when the leaf is the size of a ten-cent piece, with two and one-half pounds arsenate of lead and one and one-half gallons of lime sulphur to 50 gallons and soak the trees thoroughly. On the young caterpillars the lime sulphur acts by contact and will kill nearly all of them. The arsenate of lead will account for the remainder.

If you have so much canker worm that you are afraid of your trees being defoliated so much by their early feeding as to leave no leaf surface for spray to adhere to, tanglefoot the trunks of your trees about a week before the leaves fall, or even at the present date would catch a lot of the wingless females as they ascend the trunks to deposit their eggs.

In dealing with both the tent caterpillar and canker worm one should always remember that all insects are most easily poisoned when they are young, so, for ordinary outbreaks of them, spray thoroughly from one to five days before the blossoms open.

Oyster Shell Scale.

This is one of our most common scale insects and frequently does quite serious damage to young trees. It is a single brooded insect passing the winter as an egg under the old female scale. About the time the blossoms fall these eggs hatch and four or five days later the young lice, now white, crawl out from under the old scale and scatter over the trees, in a day or so settling down and inserting their beak or sucking tube into the bark of the tree, there to stay during the remainder of their lives. A scale is soon secreted and assumes the familiar oyster shell shape and turns to a dark brown in color. In the fall the eggs are deposited by the female under the scale which has protected her during her life and there they remain sheltered for the winter. The most common recommendation for this insect is dormant spraying with lime and sulphur and I have no doubt but that your dormant or blister mite spray helps to a great extent in controlling it.

I have seen quite a lot of dormant spraying for oyster shell and have never seen any that appeared really satisfactory. Where the spray has to penetrate or tear off a scale and then destroy a mass of eggs, it seems unreasonable that dormant spraying should be expected to control it perfectly.

The best remedy in a bad infestation is to spray as soon as the young lice are all out and crawling over the trees and before they have had time to grow a protective scale over their backs. Most writers recommend black leaf 40, or kerosene, or oil emulsion for this spray; but I have seen perfect results from the use of summer strength lime sulphur and I should recommend, where oyster shell is present in any quantity, the retarding of the ordinary codling moth spray until the young lice crawl. You will get little reduction in your effect on codling moth and control your oyster shell perfectly with the summer strength lime sulphur in that spray.

San Jose Scale.

I hardly need emphasize the importance or destructiveness of this insect. It is a subject for a complete talk in itself, but I will only speak briefly on it. In Ontario and Illinois I have seen hundreds of acres of peach, apple and pear trees destroyed by it. In my opinion it will some day, and that not distant, be *the* great factor in reducing the export of apples from certain sections which are now producing a large proportion of our apples. When that time comes, the growers who have sprayed in those sections and all of the growers in sections that have kept clear of the pest, will reap a harvest.

The San Jose scale is perfectly controlled by one spray with lime sulphur, 1 to 10, as you use for your blister mite. I can take you to properly sprayed orchards in the Niagara district or in Illinois, in the worst scale districts, where it will keep anyone busy finding a single scale. In orchards near by you can find trees dying from scale. San Jose scale, as many other serious pests, usually acts as a blessing to the careful orchardist as he will spray enough to control the scale. The benefit he gets from his dormant 1-10 lime sulphur spray in controlling blister mite, a certain percentage of black spot or scab and other pests, will usually more than pay for his spray; and the fruit from the unsprayed orchards of his competitors will, to a great extent, vanish from the market, making better prices for his own.

In Nova Scotia, I found the first scale in the province in 1912 on recently imported nursery stock. After several meetings and consultations, the growers there decided that they had plenty of blessings in the shape of insect pests and, if there was a possible chance of eradicating the scale it should be done. I was placed in charge of the work for that season and our inspectors destroyed over 700 trees, all recently planted. Since that year a provincial entomologist has been employed who has continued the work and this year his men have found only ten trees infested, which have been destroyed, and we have great hopes that he will be able to eradicate the scale from the province. I merely mention this to show you that, should you uncover any recently introduced infestations, the methods we employed, of destroying all trees infested, is working so well that the extermination of the scale seems in sight.

Fall Webworm, Red Humped Caterpillar and Yellow Necked Caterpillar.

These three fall caterpillars feed at about the same season—August and September. They are all three well controlled by parasites and seldom do extensive damage, as they confine their attention, usually, to the leaves of a young tree or one limb of a full-grown tree. If they ever get so bad that hand-picking will not control them, spraying with lead arsenate, three or four pounds to 50 gallons, will control them. The best work in poisoning them can be done when they are young.

Tussock Moth.

This insect is sometimes very common in apple orchards in the fall. It is controlled by parasites, after being numerous for two or three years; this accounts for its regular periods of increase, extending five or six years, with a sudden decrease at the end of the period. The tussock not only feeds on the leaves in the fall, but gnaws at the surface of the growing fruit often in bad infestations, destroying one-half of the crop. The holes eaten by the tussock are easily distinguished from those of the fruit worms by their being more shallow, irregular, covering often one-quarter of the surface of the apple and, being eaten later in the season, they do not heal out so well as those of the fruit worms.

The tussock caterpillar is easily distinguished, being about one and one-quarter inches in length, hairy, with two tufts or pencils of hairs extending forward from each side of the head and one projecting backward from the tail. It also has four tufts of white hairs in a row along the back.

The sprays that you employ here are not applied at the right time for tussock control. If you notice tussocks getting into your orchards you will have to spray with lead arsenate when they begin to feed, probably about July 15. Once an orchard is ridden of them, it will take two or three years for it to become reinfested, as the females cannot fly but deposit their eggs on the outside of the cocoon in which they pupated. The

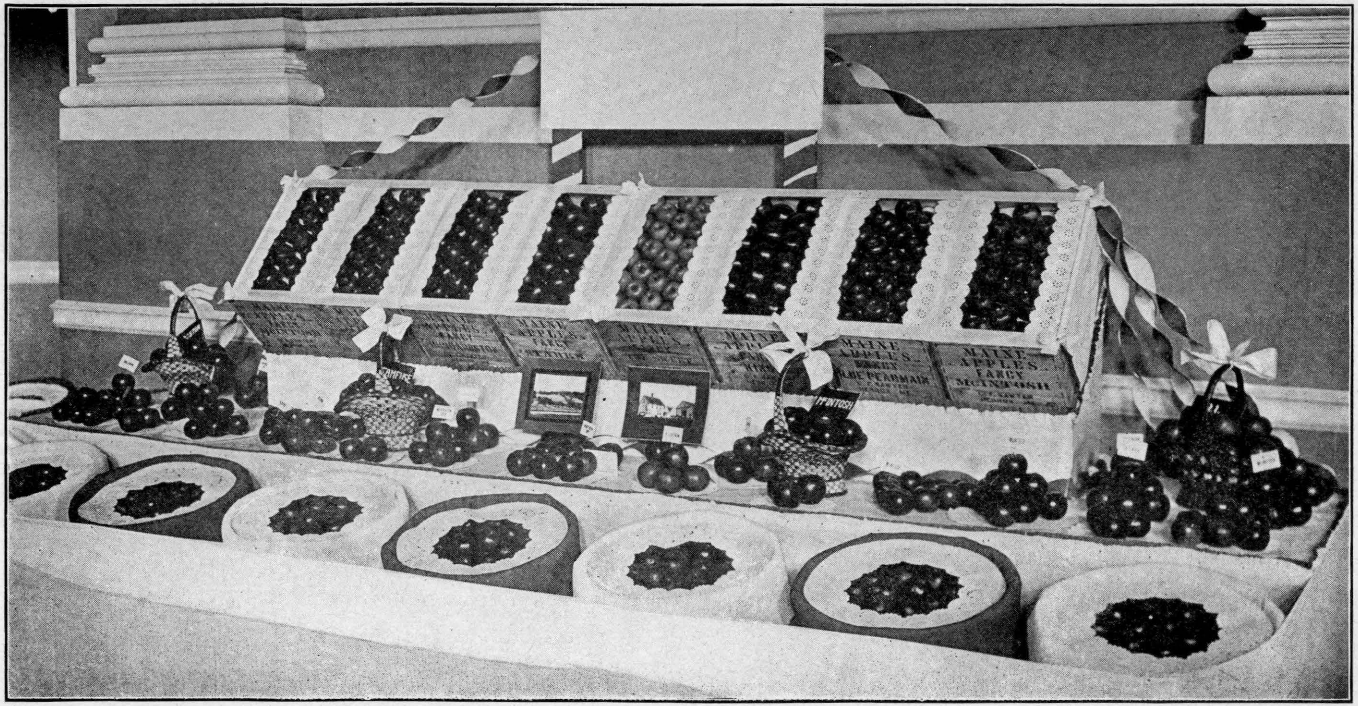


Exhibit from orchards of Charles F. Sawyer, Hebron, at Annual Meeting, Maine State Pomological Society, Portland, Nov. 2-4, 1915.

spread of the insect is accomplished by the larvae crawling from tree to tree.

Now, gentlemen, I have talked insects long enough and still I have not touched three of your most important insects, namely: Apple maggot, aphis and plant bug. Our provincial entomologist, Prof. Brittain, is working with these three insects and is finding out a lot of new things about them. He has demonstrated conclusively that you can control apple maggot by spraying at the right time. He is doing fine work on aphis and he has done the only work worth while, still unpublished, on the "False Tarnished Plant Bug" which this year has cleaned every last apple off hundreds of apple trees in Nova Scotia. What some of our plant pathologists pronounced fire blight, destroying apple blossoms, he has shown to be almost entirely the work of the bug, in some cases carrying and assisted by genuine fire blight. He has only this season devised effectual means of control of this pest, so if you want the last word of those three insects you will have to talk to Prof. Brittain.

In regard to your spraying as practiced at present. Your dormant spray will control San Jose, if you ever get it. Your spray before the blossoms will control bud-moth, tent caterpillar, canker worm, some fruit worm and some codling moth. Your spray after the blossoms will control codling moth, some fruit worm and some bud-moth.

The benefits that you get from control of codling moth, bud-moth and fruit worm should pay for all of your sprays, two to three times over; and the control of the other leaf eaters, which are somewhat periodical, you get free and your insurance against black spot you get free.

In regard to nozzles, I believe it would be well worth your while to try the Friend Drive nozzle for the sprays before the blossoms, and the Friend Calyx nozzle for the sprays after the blossoms. They both require a pressure of about 200 pounds to work properly, but are the best I have ever seen for orchard work. The Drive I have proved conclusively will control more bud-moth than the ordinary nozzle and most of the few clean apples in Nova Scotia this year were sprayed with the Calyx nozzle after the blossoms, so it appears at least equal to the others in spot control and will put spray on a tree faster and better than anything I ever saw. Just to show you the importance of nozzles: One grower was using the misty or whirlpool nozzle and thought them O. K. I persuaded him to use some of the new nozzles on a portion of his orchard. He was sure they were no good but gave them a trial. He got 57 and 22 per cent spot with the old nozzle and 19 and 9 per cent spot, respectively, with the new nozzle we recommend. We are not through testing nozzles or I would speak more on them.

I do not want you to think I am mapping out a complete spray program. I have scarcely touched sucking insects or fungous diseases, and I do not want you to take any of my recommendations any further than they go, that is, for San Jose and oyster shell scales and the biting insects mentioned.

I see in your program a question list. Question 8, "Is it best to apply the dormant spray in the fall or spring?" I should like to discuss with you. I should, by all means, apply my dormant spray in the spring and, if possible, apply it after the buds have swollen and the earliest of them even showing small green leaf tips, for at least three reasons; First, according to Mr. Hodgkiss of the Geneva Experiment Station, you can control more blister mite at that time than earlier.

Second, I see by question 14 that San Jose scale is appearing in Maine. You will get better results in spraying for San Jose by applying your dormant spray in the spring, after the winter has acted on it and torn loose the outer scales and after the scales have wakened to life in the spring, than you will by a fall application which cannot do as good work, as the living scales are then protected by a certain number of dead scales; and besides, being prepared for a cold winter, the scale seems to have more vitality and, therefore, is less susceptible to spray than in the spring.

Third, you have in New Hampshire, and I think I am safe in saying in Maine, also, for we have it in Nova Scotia—the lesser bud-moth, *Recurvaria nanella,* on which Scott and Paine published such good work in the Journal of Agricultural Research, Vol. II, No. 2, page 161, United States Department of Agriculture. In this, one of the best remedies given is dormant strength lime sulphur or soluble sulphur wash just when the buds are swelling. The wash does not kill the larvae in their hibernating quarters, but when they emerge they appear to be so nauseated with the lime sulphur odor that they drop to the ground and perish, rather than stay on the trees and bore into the buds. This insect occasionally does as much damage in an orchard as the eye spotted bud-moth, so is worth considerable when applying a dormant spray.

In closing, I want to congratulate you on the formation of your Fruit Exchange. If your experience with it is anything like our experience with our United Fruit Companies in Nova Scotia you will never regret having formed it. All of my produce is marketed and most of the supplies for my farm and house are purchased through the United Fruit Companies, and I find I can make a saving both ways and at the same time support our own organization which is working hard to improve the quality of the fruit and the pack from Nova Scotia, and is also reaching out to widen and increase the markets for our produce. I give you my best wishes for the success of your fruit exchange, which, properly managed, must mean a better living for every fruit grower in the state.

Question: What is it that causes fruit to fall that is set?

MR. SANDERS: It may be any one of a hundred different things. I do not think any one insect is responsible. It is a question of pollination. The June drop of fruit consists for the most part of apples that have one or two cells pollinated—not invariably, but usually the early drop, the size of a walnut, has only one or two cells pollinated. Later on you find more apples with three cells pollinated dropping to the ground, but most of that summer drop is due to imperfect fertilization. Your No. 1 apples should have at least four cells fertilized, with seeds in them, and, as a rule, they will have five cells; your second grade, four and three. Your No. 3, your smaller grade, I do not know just how you grade here—perhaps some with two or three cells with seeds in, sometimes of course with four, even five. There may be some external injury or overloading of the tree, but the size of the fruit depends to a great extent on the amount of pollination that has taken place in the spring; and the dropping in the spring and summer of fruit that has already set is due to perhaps only one or two of the cells being pollinated and forming seeds. Of course, one cell pollinated with seeds in it is not enough to hold the apple on the tree all summer. That is the great reason for the early drop of fruit and indicates, of course, the importance of bees in the orchard.

Question: That pink bud spray, what proportion of lime sulphur do you use?

MR. SANDERS: We use it too strong. We used last spring about 1-25, 1-30 ordinary commercial lime sulphur, and found it was too strong. We used lime sulphur too strong right straight through the season last year and did a lot of damage with our spraying material, and I do not know whether that is going to continue or not. We are recommending for this next season not more than 1-30, 1-35 for pink bud spray, and weaker for the later sprays. That is one of the things that varies with the locality, the strength that you can use lime sulphur. You might be able to use one strength in Maine and we could not use as strong as that in Nova Scotia. I would be afraid to recommend anything very definite. Be careful not to use it too strong, but how strong you can use it I would not like to say.

RESULTS FROM APPLE SPRAYING EXPERIMENTS AT HIGHMOOR FARM.

W. J. MORSE.

The department of plant pathology of the Maine Agricultural Experiment Station is making a special study of apple diseases. Highmoor Farm has greatly added to the facilities for carrying on this work. Several bulletins or reports of progress have appeared and in one of these, Bulletin 185, an attempt was made to cover in a fairly comprehensive manner what we had learned up to that time regarding the various apple diseases which occur in the state. The edition was soon exhausted and it is now, after five years, somewhat out of date. A revision of this publication will probably be made in the near future which will include in condensed form the more important results of recent studies and observations.

The Pomological Society was largely instrumental in bringing about the purchase of the farm by the state for the use of the station and has always shown a very lively interest in what is going on there. From a practical standpoint the members of the society are doubtless more deeply interested in the spraying experiments which have been carried on each year, from the first, than in any other line of pathological work which is being conducted at Highmoor. No report of the progress of this work has been rendered at a meeting of this society for some time. Therefore, I am very glad of the opportunity to tell you something about what we think we have learned in recent years regarding our own spraying problems here in Maine, based on our own experience, irrespective of the results obtained in other states, and to outline to you some of the unsolved and partly solved problems which we are facing.

I shall try to give you a notion of the object, character and extent of these experiments and state as briefly as possible what seem to us as evident conclusions as well as those which are of a tentative nature. It is not my intention to burden you with the less important details or tabulated results—these are to be found in published or forthcoming bulletins of the Station—but rather to give you a summary of the results of the past three or four years, using only such figures as are necessary to illustrate the facts as they appear to us.

The primary object of these experiments centers around the efficient and economical control of apple scab with a minimum amount of injury to fruit and foliage. This involves the nature of the spray used, as well as the time, number and manner of the applications.

Great progress has been made in the control of apple scab by spraying, but under local climatic conditions there is still much to be learned. Potato growers in southern Maine who thought they sprayed thoroughly and yet suffered severely from blight and rot this past season may not agree with me, but I believe I am right when I say that efficient control of late blight of potatoes by spraying is much more of a certainty when the proper methods are used than is the case with apple scab.

Certain sprays, including Bordeaux mixture, if applied at exactly the right time, give fully as much protection from apple scab as the last named fungicide does from potato blight. This avails but little if, at the same time, the spray removes half or two-thirds of the foliage from the tree. Also in the case of Bordeaux mixture when used on susceptible varieties, like the Ben Davis, the fruit, though practically free from scab and other parasitic diseases may be 90 per cent unsalable on account of russeting. In this connection the speaker firmly believes, however, that for those varieties of apples which it does not injure or injures but slightly, Bordeaux mixture is the most satisfactory and efficient fungicide for apple scab. On the other hand no one will deny that lime-sulphur, all things considered, is one of the best spraying materials yet devised for use on apple orchards. It was welcomed as a panacea by the enthusiasts when it first appeared, and those of us who were inclined to take a more conservative attitude then must admit that it is standing the test of time in a most creditable manner. At the same time the Highmoor experiments show that as ordinarily used, under Maine climatic conditions, it, too, has its limitations.

The Highmoor experiments have been conducted throughout with Ben Davis trees between 20 and 30 years old. In many respects this variety is very satisfactory for the purpose. It is very susceptible to spray injury and would hardly be classed as particularly resistant to scab. The number of experimental trees in different years has varied from a little less than 150 to nearly 300. As a rule each plot has consisted of 24 trees, or four rows of six trees to the row. To obtain the records of results for comparison it has been the custom to reject the crop obtained on the two outside rows, or at least on the outside half of the two outside rows. This is to avoid the effects from the spray drifting across from the adjoining plots which received a different treatment. At harvest time each individual apple composing the portion of the crop selected from each plot has been carefully examined. The total number of fruits, the number of scabby and russeted and the percentages of the latter, as well as the percentage of perfect apples, are determined. During the summer a careful record has been kept of the effects of the different sprays on the foliage.

Scale and blister mite are not troublesome in the experimental orchard so no dormant sprays have been used except as is noted later. Throughout the work the general plan has been to make the first spray application when the flower buds were showing pink, the second just after the blossoms fell and the third ten days or two weeks later. Aside from definite, intentional variations with individual plots this program has been followed fairly closely. Occasionally the time between the second and third applications has been lengthened somewhat, and once during the speaker's absence a misunderstanding led to the postponement of the "pink spray" on all but one of the plots so long that it was necessary to omit it. All applications have been made with a gasoline power sprayer, using a nozzle which gave a fine mist and with pressure varying from 150 to 200 pounds.

Results and Conclusions.

Bordeaux mixture vs. lime-sulphur. Each year a plot has been sprayed with a 3-3-50 Bordeaux mixture and another with standard dilution lime-sulphur to which in both instances two pounds of paste arsenate of lead or one pound of the powdered form was added to each 50 gallons. For the past few years dry arsenate of lead has been used exclusively from preference. These two plots provide a base line or check whereby, in connection with a third unsprayed plot, the effects of the other treatments in preventing scab and in the production of fruit russeting and foliage injury could be determined more accurately. They have also given some very illuminating data as to the relative merits of the two sprays when used upon a variety of apples which is particularly susceptible to spray injury.

Lime-sulphur has sometimes given a little leaf injury but never sufficient to be of any commercial importance. When compared with the unsprayed check plot this treatment has increased the number of russeted apples from five to ten per cent during the past three years. Scab control has been less than with Bordeaux mixture but the greatest difference has been only about three per cent.

Bordeaux mixture on the other hand has caused serious leaf injury nearly every year for the past six seasons, sometimes resulting in partial defoliation. The greater efficiency in scab control has been discounted several times over by the increase in fruit russeting. The method of treatment which gives the greatest proportion of merchantable fruit is the one which appeals to the practical man. In the past three years the per cents of merchantable apples on the plat sprayed with Bordeaux mixture have been in round numbers 30, 10 and 21. The unsprayed check which was not even treated with an insecticide gave 30, 87 and 91 per cent of the same grade of fruit. From the practical man's standpoint nothing was gained the first year and there was a heavy loss the next two years in spraying Ben Davis trees with Bordeaux mixture. It is true that the actual quality of the fruit was improved, but it was made unmerchantable on account of russeting.

The effect of different dilutions of lime-sulphur. While horticulturist of the Station, W. W. Bonns began some experiments to test the effects of different dilutions of lime-sulphur. After he left and the spraying work again came under the charge of the pathologists this was continued.

The results indicate that it is unwise to use a weaker dilution for summer spraying than is commonly practiced. Increasing the amount of lime-sulphur concentrate 20 per cent in a given amount of spray resulted in a considerable reduction of scab without largely increasing the danger of injuring the leaves and russeting the fruit. It is probable that this increase in efficiency would more than pay for the added cost of materials, particularly if the lime-sulphur concentrate is home-made.

The importance of the so-called "pink" spray. Some writers and speakers have laid great stress upon the importance of the spray application made when the blossom buds are showing pink. Present knowledge of the life history of the apple scab fungus and some experimental data obtained in Maine as well as elsewhere tend to support this view. Orchardists should by all means have spraying materials on hand and see that the necessary apparatus is in perfect running order so that this application may be made without delay when the proper time comes. On the other hand, in Maine they need not necessarily feel that the spraying operations for the current year are doomed to utter failure if, through accident or for some other unavoidable reason, it is omitted altogether.

Work along this line has been going on at Highmoor for four years. Two seasons out of the four, omitting the blossom bud application entirely, actually resulted in a higher percentage of merchantable apples. Another season the increased efficiency due to the first application was but slight. The differences were not great in all three cases and doubtless were within the limits of experimental error. Therefore, the omission of the first spray three years out of the four led to no material difference in the results. On the other hand, the omission of the so-called pink spray the first season it was tried meant a difference between success and failure in the spraying operations of the year. This was in 1912, a particularly bad one for scab. Where all three applications were made 90 per cent of the fruit was sound and perfect. Only about 50 per cent of the same grade was obtained where the first application was omitted. Nearly all of the remainder of the fruit on this plot was scabby.

Arsenate of lead as a fungicide. Perhaps the most striking and certainly the most unexpected result of this series of experiments is the discovery of the appparently high fungicidal value of this well-known insecticide in controlling apple scab. Its value in this respect has been entirely ignored in almost all other work of this kind. In a large proportion of the apple spraying experiments conducted in this country it has been the practice to entirely overlook any possible fungicidal effect of the insecticide used in the combined spray.

At the last meeting of this society a speaker from out of the state told you in a most emphatic manner that arsenate of lead had no fungicidal value when used alone against apple scab. At that time I had already obtained figures from a series of three successive yearly experiments at Highmoor Farm from which one could draw nothing but quite the contrary conclusions. The data from the fourth of this series have just been obtained. While the test for the current year was less severe than usual, the results as far as they go do not contradict those previously recorded.

The first suggestion of the fungicidal value of arsenic of lead for apple scab came in 1912. Then four pounds of the paste form alone in 50 gallons of water gave as good or better scab control than did a 3-3-50 Bordeaux mixture of lime-sulphur plus two pounds of the paste to each 50 gallons of spray. No unsprayed check plot was available that year. The arsenate of lead plot was located at the corner of the orchard more exposed to air and sun. It was thought that this might have been a factor leading to the relatively small development of scab upon it. This factor was eliminated in the later experiments.

In 1913, an unsprayed check plot was added and dry arsenate of lead substituted for the paste. One plot was sprayed at all applications with two and another with one pound of the powder to 50 gallons of water, or equivalent to about four and two pounds of the paste form respectively. Nearly 39 per cent of the apples on the unsprayed plot were scabby. Almost perfect scab control was obtained with Bordeaux mixture, the larger amount of arsenate of lead used alone, and lime-sulphur —the efficiency being in the order named. It should not be forgotten that one pound of dry arsenate was added to each 50 gallons of Bordeaux mixture and lime-sulphur used. This smaller amount of the arsenate when used alone reduced the amount of scab from 39 to less than 16 per cent. Therefore, it is more than a possibility that this insecticide added to Bordeaux mixture and lime-sulphur may materially contribute to the fungicidal effect of the combined spray.

A large amount of fruit russeting was experienced in 1913, apparently due to natural causes. This was considerably increased by the action of some of the sprays. With Bordeaux mixture and lime-sulphur this increase amounted to 40 and 11 per cent respectively, while it was actually less on the plot sprayed with the larger amount of dry arsenate of lead than on the check. On account of the last mentioned fact the relative value of the arsenate of lead spray was still more apparent that season. About 12 per cent more perfect apples were obtained with it than where standard dilution lime-sulphur was used.

Neither in 1914 nor in 1915 did scab develop sufficiently to give a rigorous test of the fungicidal properties of arsenate of lead. In scab control in 1914 two pounds of dry arsenate of lead in 50 gallons of water fell about three per cent behind lime-sulphur containing one-half this amount of the insecticide, *but the per cent of merchantable apples was practically the same.* In 1915 the combined lime-sulphur spray gave a fraction of one per cent better scab control, but on account of russeting only about 90 per cent of the apples were merchantable. In contrast with this, because of freedom from russeting, the larger amount of arsenate of lead used alone gave over 97 per cent of the same grade of fruit.

Do not misunderstand me. I have not reached the point where I am ready to recommend that Maine orchardists depend entirely on arsenate of lead to control both apple scab and chewing insects. I am not yet ready to advise that such action be taken with regard to the Highmoor orchards. I prefer to take a much more conservative attitude and suggest that the possibilities of arsenate of lead as a spray for scab are well worth looking into. The figures obtained during the past four years are as given and are certainly very suggestive. Time can only tell whether or not they can be repeated year after year and the same results obtained in general practice.

Strong fungicides for the blossom bud spray followed by arsenate of lead alone. The high efficiency of arsenate of lead in scab control suggested the following possible modification of summer spraying practice. Use a strong fungicide combined with a smaller amount of arsenate of lead when the blossom buds are showing pink. For all later applications depend entirely on arsenate of lead, using at least two pounds of the powder or four pounds of the paste to each 50 gallons of water. Work along this line has been going on for two seasons. For the first application 3-3-50 Bordeaux mixture and lime-sulphur 20 per cent stronger than standard have been used.

The crop in each case has been very free from scab, but on account of the fact that the omission of the first application of standard dilution lime-sulphur on other plots failed to show an increase in scab, it is impossible to draw definite conclusions regarding the chief object in view. However, all the evidence obtained tends to confirm the results secured where arsenate of lead was used alone throughout the season and in previous years.

Apparently Bordeaux mixture is ruled out on the Ben Davis, even for the first application when the leaves are unfolding, and the blossom buds are not yet open. It produced more or less leaf injury both seasons. What is more strange, russeting of the fruit was materially increased when compared with the check and with the plot sprayed with arsenate of lead throughout the season. It seems hard to explain why an application of Bordeaux mixture made before the blossoms buds opened should produce a russeting of the fruit formed considerably later, but this is what the figures show. In 1914 this plot adjoined one sprayed three times with Bordeaux mixture, and it was thought that the increased russeting might possibly result from spray drifting from the latter plot. A relocation of the plots in 1915 prevented any such a possibility, but the increase in russeting appeared just the same. No such difficulties were experienced where lime-sulphur 20 per cent stronger than standard dilution was used for the first foliage spray.

Dormant sprays for insects as affecting scab control. A few years ago the pathologists of the Station demonstrated quite conclusively that the scab fungus may live over winter on the young twigs of susceptible varieties like the McIntosh. Some work done by one of the officers of this society, F. H. Morse of Waterford, which came under our observation showed that a late dormant spray of lime-sulphur in addition to the regular summer applications would materially reduce the amount of scab on the foliage under such conditions.

No trouble has been experienced with scab on the limbs of Ben Davis at Highmoor, but we have been asked frequently if a dormant spray could be safely used after the leaf buds had begun to unfold and the flower buds had begun to swell. We have always advised against this, but a plot was sprayed in this way at Highmoor last season to test the matter.

As was expected, considerable burning of the young leaves was experienced and some of the flower buds were injured, a few being killed outright. These effects soon passed away and so far as could be determined the total yield of apples on the plot was not lessened. A considerable amount of russeting did appear. It happened that this plot also adjoined one sprayed throughout the season with Bordeaux mixture. Therefore, in addition to the two central rows of trees used for the regular record the two outside rows were harvested separately and the percentages of russeted apples determined. It was found that the row nearest the Bordeaux plot showed even a smaller amount of russeting than the one farthest removed, thus throwing considerable doubt on the hypothesis that the spray from the Bordeaux plot influenced the results on the one where the dormant spray was used.

Extra fine sulphur flour as a fungicide for scab. For the past two seasons ten pounds of very fine sulphur flour in suspension in 50 gallons of water containing one pound of dry arsenate of lead has been used on one plot in the series. This material has shown considerable fungicidal value, but is probably not practicable for the commercial orchardist.

Copper-lime-sulphur. Some successful experiments were reported a short time ago by the pathologists of the Virginia Agricultural Experiment Station with what they called "copper-lime-sulphur." This was ordinary summer strength lime-sulphur to which two pounds of copper sulphate was added for each 50 gallons. A test of this material at Highmoor Farm in 1914 led to fully as much foliage injury and fruit russeting as where Bordeaux mixture was used. The effects were very disastrous, indeed.

Proprietary compounds. It is not the policy of the Station to attempt to test indiscriminately the various proprietary compounds which are placed on the market from time to time for orchard spraying. However, for special reasons two of these have been included in recent experiments.

One was a dry powder much advertised and sold in the state as a substitute for lime-sulphur. The manufacturers did not claim this in their advertising matter, but many orchardists purchased and used the material under the supposition that it was identical with lime-sulphur, except that all of the water had been removed. The first year at Highmoor two pounds of the powder and one pound of dry arsenate of lead were used in 50 gallons of water. Efficient scab control was secured, but the effects on the foliage were disastrous. The experiment was repeated the second year but the amount of the fungicide was reduced to three-fourths pound to 50 gallons. The results were practically the same as before. No attempt was made to test the efficiency of the material as a dormant spray.

The other material was in the form of a paste. Seven pounds of this and the same amount of water and arsenate of lead were used as in the last mentioned experiments. Both seasons this compound controlled scab very well and no injury to fruit or foliage was experienced.

CONCLUSION.

A brief summary or restatement of the essential facts which have been presented may be of service.

Locally it is not always safe to generalize too much upon results secured in or to adopt without reserve conclusions derived from work done in other parts of the country or abroad under different climatic and soil conditions. Also, in some instances these conclusions have been based upon a relatively small number of trees, the results of a single season, or at the outside limited number of seasons. At Highmoor, the Ben Davis, a variety which scabs readily and is quite susceptible to spray injury, is used. A relatively large number of trees are included in the experiments, and the latter are planned to cover an indefinite series of years.

While Bordeaux mixture is a very satisfactory fungicide to use on resistant varieties, it has been shown at Highmoor, in conformity with the almost universal experience under like conditions elsewhere, that it is very unsafe to use it on those varieties which are particularly susceptible to spray injury. It has given good scab control, but on account of russeting the yield of merchantable apples has averaged less than where no spray whatever was applied.

Standard summer dilution lime-sulphur controlled scab nearly as well as 3-3-50 Bordeaux mixture and produced very much less fruit russeting. Slight leaf injury occasionally occurred but this was negligible from a practical standpoint. Increasing the strength of the lime-sulphur summer spray 20 per cent increased the percentage of merchantable apples for three successive years.

Timely application of the so-called "pink spray" is important and essential for safety, but its omission three years out of four led to no increase of scabbed fruit. Decidedly contrary results were obtained one season.

The use of arsenate of lead alone, slightly in excess of the amount commonly applied as an orchard insecticide, has unexpectedly given very satisfactory scab control for four successive years. These results are simply suggestive—it is still an open question how far Maine orchardists should depend upon it as a fungicide for scab.

The discovery of the apparent fungicidal properties of arsenate of lead suggested the following modification of the usual spraying program: Use a relatively strong, well-recognized fungicide combined with arsenate of lead, just before the flower buds open, followed by the stronger arsenate of lead spray alone for later applications. For two successive years seasonal conditions have made the results from this part of the work inconclusive from the standpoint of the primary object. They do appear to confirm the tentative conclusions regarding the value of arsenate of lead in combating scab. Also from them it is apparent that Bordeaux mixture is ruled out, even for the single, early application, on account of increased russeting of the fruit.

One trial of dormant strength lime-sulphur after the leaves began to unfold caused injury to both the young leaves and flower buds, but apparently the fruit crop was not lessened. However, the latter showed an abnormal amount of russeting.

A suspension of very fine sulphur flour showed considerable fungicidal value, but its use is probably not practicable for the commercial orchardist.

Copper-lime-sulphur produced as serious foliage and fruit injury as did Bordeaux mixture.

Two proprietary spraying compounds tested gave good control of scab, but one of them caused serious leaf injury and defoliation.

PROBLEMS OF A COMMERCIAL APPLE GROWER.

S. W. Fletcher, Fisherville, Va.

Mr. President, Ladies and Gentlemen:

If you will look at the program you will notice that my subject is problems of a commercial apple grower. That means it is personal. If I had come to you fifteen years ago to talk on this subject, when I was just out of college, I have no doubt that I could have told you collectively and individually just how you ought to do to raise apples, without even visiting your farm. But I have travelled since then, been up against the rough edges of practical work in endeavoring to make a farm pay, and I know now, as doubtless you know, that these problems are personal and individual. All I shall attempt to do is to tell you how I have met these problems on my farm; possibly my experience may have some application to yours.

Cost of Production. The biggest problem in apple growing, as I see it, is to keep down the cost of production. The days when apples brought five dollars a barrel, as average return, are gone, never to return. Every fruit has passed through boom days and periods of depression. It was so with the orange, the prune, and the grapefruit; it has been so with the apple. A few years ago, between 1908 and 1912, everybody was getting $3 or $4 a barrel for apples. Now most of us are satisfied if we net $2.50; at least, in the wholesale apple country where I am located. Some years, like this one, we get more. We have come to the time when the man who makes money in growing apples is the man who can produce good fruit at a low cost. With increasing competition, every business man endeavors to cut out the wastes, to eliminate the unnecessary expenses, to produce a good article at as low cost as possible. This is our biggest problem, aside from that of marketing, which I shall not discuss. The points I shall mention this afternoon have to do mainly with means of growing good apples cheaply.

Location. It is a great advantage to be located where you can get your apples to market at a reasonable cost. This means that you must have, if you can get it, competing means of transportation. I am fortunate in having three competing railroads within five miles of my orchard, and while I ship mostly over one railroad, I am satisfied that the fact that there are competitors keeps my rate reasonable. You have heard that competition is the life of trade. Competition is also the chief incentive to reasonable freight rates. In selecting a location it will be a decided advantage not to be at the mercy of any one means of transportation.

The distance of the orchard from the shipping point, and the character of the road, have much to do with the cost of production. I showed you last night pictures of Virginia growers hauling apples twenty miles over rough and hilly roads, paying forty-five cents a barrel to put the apples at the depot. I am located one-quarter of a mile from the depot, on an asphalt road, and it costs less than two cents to put a barrel of apples on the car. This is a big advantage. I could sell my apples for $2.50 a barrel at the depot and make as much as this other man if he sold for $3. An apple grower ought to be a good roads man. We have had a quarter million dollar bond issue which was used to macadamize the main roads of my district. I now carry thirty-five barrels of apples on a two-horse load to the depot over that good road; formerly I carried about fifteen. I save my increase in taxes on account of the bond issue a great many times over every year on that one thing alone. The fruit grower has such a bulky article to carry to market that he should be a worker for good roads as a matter of self-interest, if for no higher reason.

The Site. The site of the orchard may influence the cost of production. You know of the intense interest in the western states in smudge pots for frost protection. It sometimes costs $50 an acre to equip a western orchard with the means of protecting it from frost. Now how much more economical it is for us in the east to select a location which is sufficiently elevated above the surrounding country to secure practical immunity from frost. We have in Virginia many hillsides and mountains which have on them what we call the thermal belt. This is perhaps half way up the mountain side, ranging from one-quarter of a mile to a mile in width. No frost ever occurs in this belt. The cold air coming down the mountain, being heavier than warm air, settles underneath the warm air in the valley, and pushes it up until it stands at a certain level against the mountain side. That is where the frostless zone occurs. You may not have conditions like that in Maine, yet you know there is a great difference in the ability of different sites to resist frost and you give preference to the uplands. Frost immunity has much to do with the cost of producing apples. I have had a crop of apples every year for seven years; this makes my cost of production lower than it would have been had I missed a crop every now and then.

Varieties. I do not need to urge you to grow the standard varieties and not the novelties. Grow the varieties which are tried and proven in Maine, and your market demands—not what I tell you are best in Virginia. There are four standard sorts in Virginia: the York Imperial, Albemarle Pippin, Winesap and Ben Davis. The York Imperial is our Baldwin, the great commercial apple, bearing large crops of fair quality apples under average care, and selling at good prices. The Albemarle Pippin, which is very much higher in quality, is our great export variety. Practically all of them are sold in England, sometimes at very high prices. Some years they bring $8 and $10 a barrel, but the average is not more than $4. Although this variety often sells for twice as much as the York, the York is frequently more profitable because it costs so much less to produce it. The York will bear nearly twice as many apples, year after year, as the Pippin. It requires only three sprayings, while the Albemarle Pippin needs three more to protect it from bitter rot. This shows that it is not the price you get for apples that measures the profit; it is the difference between the cost of producing the apples and the selling price. The Winesap is the Spitzenberg of Virginia; of high quality, keeping late into June, and a very desirable late-storage variety.

The Ben Davis. I will not forget the Ben Davis, specimens of which I have brought here, not to make myself an object of ridicule to you who grow the Baldwin but to illustrate this point—grow varieties which are most adapted to your locality. I think you can see by these specimens that Ben Davis is at home in Virginia. It grows to a large size, has good color, and good keeping qualities. It is fully developed and matured. It seemed to me, as I looked over some of your Maine Ben Davis in the excellent exhibit downstairs, that it is questionable whether you are wise in growing Ben Davis, commercially. You can grow Baldwins infinitely better than we can; it would be foolish for us to attempt to grow Baldwins in competition with you. I think it is equally foolish, if I may be permitted to suggest it, for you to attempt to grow Ben Davis in competition with us. The Ben Davis needs a longer season than you have in Maine. Ultimately each section will see the wisdom of growing only the varieties which can be brought to the highest degree of perfection in that place, rather than attempt to grow varieties which have acquired a reputation elsewhere.

Our Virginia Ben Davis has the same delightful sawdust flavor inside of it as those you grow in Maine. I don't know as the quality is any different. But it sells. We send it to the extreme south—to Mobile, Birmingham, Atlanta and New Orleans. In that hot and trying climate, the groceries can put it on the fruit stand and it will look good two weeks later, when more tender varieties would go down quickly and not be salable. For selling in hot climates, for putting on the market in late spring, after other and more desirable kinds have gone, the Ben Davis, if grown where it reaches its own peculiar standard of perfection, has a distinct place. I think anybody in our section is justified in planting not over ten per cent of his orchard in that variety; but I question the wisdom of growing Ben Davis in Maine, where it does not reach maturity, and where you can grow Baldwins to such perfection as I see in those downstairs.

In selecting varieties for the commercial orchard, get those which will give some latitude in harvesting. I do not attempt to grow summer or early fall varieties. I have only late fall and winter sorts. But being obliged to bring in a picking gang of thirty to fifty men, I want to give them enough work so as to make it an object for them to come to me every year. That is why I have planted along with my winter apples some late fall and early winter sorts, such as the Grimes Golden and the Mother, which can be picked ten or fifteen days before the winter sorts are ready to come off, and will extend my picking season that much. This counts a great deal when we come to the labor problem.

Planting with Dynamite. Perhaps some of you have tried the much advertised method of dynamiting in planting the trees. Our conclusions in Virginia have been quite unanimous that it is not expedient or profitable, except on land which has very stiff subsoil or a shale close to the surface, and such lands should not be put in orchard, anyhow. We have listened to a great deal of claptrap about dynamiting apple lands. We have been even advised to dynamite mature, bearing orchards, to set off little blasts of dynamite every forty feet to loosen up the land. This seems to me the most senseless thing that could be recommended. Experiments in New Jersey and Pennsylvania, and in Virginia, have shown that on land properly fitted for apple trees the ordinary digging of a good hole gives just as satisfactory results as dynamiting. If dynamiting at all, it should always be done in the fall so that the loosened soil may fall back into place to some extent before the trees are set in the spring, otherwise the trees may suffer from a spring drought.

Tillage Problems. I showed you last night pictures illustrating soil management in the mature orchard. I tried to bring out the fact that there are occasions when clean tillage of the bearing orchard may not be as desirable as keeping it in sod part of the time. My bearing orchard is tilled one year in three. The orchard is plowed or worked with a cut-away harrow in February, and is cultivated three or four times, perhaps until the first of July; then it is seeded to cow peas or soy beans, which make a nice growth before frost. Early the next spring that land is disked and is seeded to red clover in March or April. I have never found any green manuring crop, not excepting crimson clover or hairy vetch, which equals old fashioned clover in soil improving value and general adaptability for the bearing apple orchard. It is clipped two or three times during the season with the mowing machine, and the clippings mulch the ground. It stands another year, so that the orchard is two years out of three in red clover. It is then plowed and comes into tillage and soy beans again. For mature orchards—not young orchards—on land which is reasonably moist and reasonably strong in fertility, this plan works all right in Virginia. You will have to ask your experts here whether it is practicable in Maine.

A word about the relation of cultivation to certain diseases of apples. We have considerable trouble with the brown spot, or punk spot, as we call it, especially on our Yorks and Jonathans. You have it on Baldwins. There is a distinct relation in Virginia between the prevalence of those diseases and tillage. In those orchards which are cultivated very thoroughly and frequently, so that the trees make a luxuriant growth and heavy leaf surface, as they will under high tillage, invariably, you will find a larger proportion of the apples with the brown spot than in orchards which are but little tilled and which make a somewhat slower growth. On trees which are bearing a light crop, or which have been heavily fertilized so that the growth is luxuriant and the amount of drain per tree by the crop is small, we find the most brown spot. I have come to the conclusion that a slow growth, secured by withholding tillage or fertilizer, and by allowing the trees to set a comparatively heavy crop alternate years, is the most practical way we now know of reducing the amount of brown spot.

Pruning. In the pruning of the orchard there are some problems that have a bearing upon the cost of production; particularly, the height of the head. In the valley of Virginia apple trees do not grow as high as they do here. But they can be headed too low. The lower the better so long as it is not too inconvenient in working around them. Nearly every apple orchard has to be either plowed and harrowed or mowed with the mowing machine. Some people, I think, have gone to the extreme in low heading; they have trees headed so low that it is extremely difficult to work around them with the teams. I head a little over two feet high, and after the second year do not cut back at all unless the trees are getting up to about twenty feet in height.

There are some who advise: "Don't touch a tree with a knife any more than is necessary to let in the sun." This does not work with me; I have tried it. If you allow young trees in Virginia to make their natural growth, without cutting them back the first two years, or three, after planting, they become sprawling and straggly; the first heavy crop of fruit bends them down to the ground and splits off the limbs. We are obliged to cut back the trees heavily the first few years in order to strengthen and thicken the trunk and form the head. After the third year the less pruning the better, so only the top is kept open.

Summer pruning, we believe in Virginia, is a special practice for special conditions. This is another illustration of the danger of importing bodily methods that have been found successful in another section, without first determining whether the conditions are the same. On the Pacific coast, particularly in the Puget Sound country where they have a very temperate climate and trees make an extreme vegetative growth, summer pruning is necessary and desirable. They have to check growth in order to get fruit. Summer pruning in Virginia in the same measure would seriously hurt the trees. We use summer pruning chiefly on young trees, six or seven years old, which ought to be coming into bearing, but which have not done so because they are making too much wood. A light pruning in July usually brings these trees into bearing. It is a special practice for certain trees, not a general practice for all trees. Most of our pruning is best done in the spring and during the winter. I start pruning in the fall as soon as the leaves are off and keep at it during the winter, whenever the weather is mild. We have few days when the wood is frozen, so that we can prune all winter without danger of winter injury, which is an advantage in a large orchard.

Fertilizing. There are the two opposing camps on the subject of apple fertilizing. There is the report of the New York Experiment Station, showing that in western New York there is no profit in fertilizing apples at all; and there is a report from the Pennsylvania Experiment Station showing marked profit from fertilizing apples. I have found it distinctly profitable to use fertilizers. I do this, however, with the tree as a unit, not the orchard. In other words, instead of applying a thousand pounds of fertilizer per acre, I apply so many pounds per tree, as the tree seems to need it. If you go through any orchard in the summer time, you will see distinct individuality in trees; some are weak; some are strong; some need help, some do not. I fertilize according to the condition of the tree, as recorded in my orchard book. A tree to tree record in a commercial orchard seems like a pretty big task, yet I believe that until we come to the point where we deal with the individual tree rather than with the orchard as a unit, we shall not realize maximum returns. When the time comes to make my estimate of the coming crop, in August, I go through the orchard with a set of pocket note-books, a page to a tree, on which I have a record of the crop of each tree, as well as its health and vigor, for each of the seven years I have had the orchard. I have to estimate the crop anyhow in order to know how much barrel stock to order, and it is but little more trouble to take this book along and record the condition of the tree with the estimate of the amount of fruit it will bear. If the tree is sub-normal and needs a stimulant, tie a white tag on it. Then when hauling manure to the orchard in the winter, pick out these tagged trees, so as to make the manure go as far as possible.

I always use manure if I can get it; it gives larger returns than any commercial fertilizer I have used. Even when I drive four miles to a livery stable and pay a dollar for a two-horse load, I get more for my dollar than from any fertilizer I have ever used. When the supply of manure fails, I have used one part of nitrate of soda to three parts of acid phosphate. Sometimes I have used one part of potash also, but our soils do not need potash as much as yours do. This fertilizer mixture is applied just after the blossoms drop. Nitrate of soda is quickly soluble and blossoming is an exhaustive process, so we get immediate results if applied at that time.

Spraying Machinery. I wish to emphasize again what I said last night about spray machinery. We must revise our estimates as to the ability of a machine to cover trees. Twenty acres of mature trees to one power outfit is plenty. I have been trying to cover forty acres of twenty-year-old trees with one gasoline outfit, and I am satisfied that I have lost the price of three machines, or more, by doing so. It takes about seven days to cover my orchard thoroughly. In seven days the calyx cups, which are the most feasible point of attacking the codling moth worm, with us, have begun to close. I ought to get that orchard sprayed in five days, and if one machine cannot do it, I ought to get another.

The gasoline outfit has one advantage which makes it superior to the new type of compressed air outfit, which has the compressor and the engine attached on the wagon with the tank. We need the gasoline engines to run our sizing machines. Aside from this the compressed air outfits are excellent. They certainly use somewhat less liquid than the gasoline outfits. They make a mist spray, not a driving spray, and they are simpler and considerably lighter than a gasoline outfit.

Spraying Treatment. We heard an excellent discussion this afternoon of the diseases that attack Maine fruit. You may be interested to know what we have to fight in Virginia. On the whole, we have less to contend with in Virginia than you have. I never spray more than four times a season and find that this controls pests reasonably well.

To comfort any who may be alarmed as to the outcome of the San Jose scale in the apple orchards of Maine, let me say, we have the San Jose scale in Virginia, but it is the least of our troubles. Fifteen years ago the apple growers of Virginia were demoralized at the prospect of the scale coming into their orchards. They supposed it would ruin the business. Now it is considered the easiest pest to control of any we have. About one year in three I am obliged to apply the San Jose scale spray, when the trees are dormant. There is always a little scale, just enough to continue the species in the orchard, but not enough to make the fruit unmerchantable. I apply this spray as late as I dare, for two reasons: First, because the scale is more vulnerable then, having passed through the winter, and the shell around the insect has become thin so that it is easier to kill; second, because late dormant spraying kills aphis. When the winter buds are opening, so you can barely see green in the end, the rosy aphis, one of our worst insect pests, has already begun to hatch and we can see the little lice on the cluster buds. By applying the strong dormant spray then, we not only kill the scale but we also control the aphis to a large extent. Of course there is danger that if it turns warm suddenly the blossoms will come out in a hurry and you will be caught with your dormant spraying unfinished. There is this danger, but I prefer to run the risk and kill the two bugs with one spray.

Question: And you don't get any injury when you delay the dormant spray?

MR. FLETCHER: No, except there are a few buds blasted. When this spray is applied we cannot see the blossom at all; the cluster bud, or winter bud, is barely open, so you can see the tips of the green leaves and possibly the pink of the petals.

Question: What is the strength?

MR. FLETCHER: The regular strength of 1–7, one part of concentrated lime-sulphur solution, testing 32 degrees, to seven of water. The second spraying that I give is right after the petals fall. I have never seen a scab spot in my orchard, even on a Winesap or Ben Davis. Ten miles from me, across the Blue Ridge, they have as much trouble from scab as you do, and have to give one spraying before the blossoms open, while the buds show pink. This shows the utter futility of any man advising another on these matters, unless he knows the conditions. So I omit the pink spray and apply the first spray after the blossoms fall, the second, ten days later, and the third, nine weeks after the blossoms fall, this being for the second brood of codling moth. These three sprays usually give reasonable protection.

Codling Moth and Rosy Aphis. Our greatest pest is the codling moth. It fairly makes my heart sick when I go to the cull shed to see the large proportion of apples, otherwise perfect, which the worm has made unmarketable. We not only have two broods there, where you have mostly one—two per cent of your first brood, I understand, goes into a second brood—but also our moths emerge over a longer period, so it is a continual fight between the time the petals fall until the first of August. We are doing pretty well if we can get out with apples 95 per cent free from worms.

We have little trouble with green aphis except on young trees, one to four years set. After trying various ways of spraying, I have adopted the method of dipping the ends of the twigs into a pail of tobacco decoction. The aphids are on the tips of the branches; a man with a bucket of tobacco decoction—black leaf 40—dips these branches in and there is no trouble that year, as there would be if the tree were simply sprayed, because of the curled leaves. In bearing orchards, I am obliged to spray with black leaf 40, two years out of three. Those years when I do the dormant spraying for scale late in the spring, I rarely have enough aphis to make further treatment necessary. Other years I have to put black leaf 40 into the spray that is applied just after the petals fall. As I have no scab, I do not need to apply the pink spray, which is usually the best place to use the black leaf 40 for aphis. We control the pest well enough by putting it in the codling moth spray, thereby giving a triune spray; the lime-sulphur for cedar rust, the arsenate of lead for codling moth, and the tobacco for aphis, all three in one spray. As far as I can see each is as effective as if applied individually.

Question: Will you please tell us the amount of black leaf 40 for that aphis spray?

MR. FLETCHER: We use half a pint to fifty gallons of spray. Some of our growers are making their own tobacco decoction. Virginia is a tobacco growing state. We can get the stems and refuse very cheaply. By simply soaking the stems over night we can recover a large percentage of the nicotine, varying with the kind of tobacco used. After being soaked the stems still retain practically all their fertilizing value and can be used around the trees. I am very much in hopes that the home preparation of tobacco decoction will reduce the cost of this necessary spray material.

Question: You consider that the best spray to control aphis?

MR. FLETCHER: I know of nothing better.

Home-made Lime-Sulphur. I make my concentrated lime-sulphur, and have for four years. I see no reason for paying $7 to $8 a barrel when I can make it at home for $3. I have 40 acres of bearing orchard 25 years old. The cost of the outfit for making this preparation at home was $50. For $40 I bought a steam feed cooker, which is a small boiler, about one and one-half horse power. There had to be also some piping connections. This boils 50 gallons of material at a time. I use 100 pounds of commercial sulphur, 50 pounds of quick lime, to make 50 gallons of the concentrated solution. Many of our growers get better results with hydrated lime; it enters into

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solution better than quick lime and is less apt to have carbonate of lime in it. If you use hydrated lime, put in 67 pounds instead of 50, since hydrated lime is one-third water. The home-made solution costs me $3 a barrel and tests an average of 29 degrees; it is diluted in proportion to the ratio it bears to the standard 32 degree commercial solution.

Bracing limbs. The limbs of our apple trees are very brittle; they are not as tough as the limbs of your Baldwins. So we resort to wiring them instead of propping. In the center of each tree, about eight feet above the crotch, there is a small iron ring, from which wires radiate in all directions to the main limbs so as to brace one another. The wires are attached to the limbs by screw-eyes. This we have found much better than propping. There is less breakage and it is a permanent improvement. Props rot and break.

Thinning. I wish to say a word more about thinning. This is another proposition that has been imported bodily from the west; we have been told that we should thin apples to eight inches apart, as they do in Oregon. I am not sure whether we ought to or not, at least with certain varieties. I have been thinning for five years and have come to the conclusion not to thin the York Imperial again unless the tree is very heavily loaded or is weak. Certain varieties, including the York Imperial, sell better if of medium size rather than large size. If we should thin Yorks to eight inches apart, the distance recommended in the west, they would be over-grown, lop-sided, and speckled with brown spot. If we leave them nearly as they set, almost touching one another, we get good medium two and one-half to three inch fruit, which keeps well and sells well. It is better to get that crop and let the tree rest a year, if necessary, than to thin it every year and get a lot of overgrown, spotted fruit each year.

With the Winesap and some other varieties, thinning pays, if the tree is overloaded. It does not seem to have any effect on the quality of the fruit of these varieties. So, I say, thinning must be done with discrimination, if at all.

We have one advantage in Virginia that is not enjoyed everywhere; our long picking season. We can begin picking near the middle of September and continue until the last of

October or first of November. It may be more practicable to do whatever thinning is necessary the middle of September, rather than in June; in other words, let the fruit hang as thick as it will without breaking the tree, and along in September pick off the outside fruit that is beginning to color and sell it for the export trade, leaving a whole month for the remaining apples to size up and color on the trees. This may be better than to pick off apples in June and drop them on the ground and get nothing for them.

Harvesting. Some of our growers have found it best to pay for picking by the piece; the usual price is ten cents a barrel. I do not like this plan. The apples are not picked as carefully and it costs more. This year my pickers averaged twenty-five barrels each a day, yet I was only paying them $1.50 a day. You can see why I am not enthusiastic about paying by the piece. It is a good plan, however, to have a check system even when paying by the day. As each picker brings in a barrel of apples, give him a check. At the end of the day he returns the checks to the picking foreman, who records in a book the amount of apples each man has picked. This gives a line on whether a picker is a drone or a worker; the drones are eliminated, and there is a standard set which we expect each picker to reach.

This year I used rubber stamps entirely for stencilling the barrels. Tin stencils, as you know, usually get twisted and the letters are broken, resulting in a blurred and unattractive stencil. I had some rubber stamps made, some with five-eighth inch letters, some smaller. One of those stamps would have on it "Virginia" in rubber type, another would have on it "Apples." Having the inked pad before you, you take these two stamps in your hand, put them on the pad, then on the barrel, and your legend is stamped in one-tenth the time it takes with the old tin stencil. I shall never use a tin stencil again; the rubber stamp lasts longer, costs no more, and saves time.

Selling Apples. Some of our growers sell "on the trees." The speculator goes through the orchard and says, "I will give you so much for the apples just as they hang on the trees." Likely as not that is in August, possibly July, long before the apples are ripe. That is speculation; it is not apple selling. The buyer knows how to estimate a crop of apples on the trees better than the grower; the grower only estimates his own orchard, while the buyer estimates hundreds of them everywhere. It is his business; he is more keen at it. Nine times out of ten the orchard packs out many more barrels of apples than the grower had estimated. Of course the buyer has to take the chance of hail, windstorms, disease and other mishaps between the time he buys them and when they are ready to be picked, and he makes big allowances for that in his price. Selling on the trees, while it relieves the grower of a lot of work, is a very unsatisfactory way of marketing apples; nine times out of ten the grower does not get full value for his crop.

Selling to a buyer f. o. b. shipping point is much better. The disadvantage is that the grower often sells to a different buyer every year and so does not acquire a reputation for his pack. One crop does not help to sell another. This is one of the great advantages of a coöperative selling organization.

Consignment gives good results if you get in touch with a good commission man and stay with him year after year. Most of us do not do this. We sell to the apple speculator when prices are good and buyers numerous, but the next year—as in 1914, when few buyers were around—we consign, because we have no other way of handling it, and we get poor returns. I have sold apples in all these ways; but the nearer I can come to f. o. b. business the better off I am. I find it best to take a fair price for apples in the fall at the packing shed rather than to put them in storage or consign. The storage and selling of apples is a business by itself, wholly apart and separate from the business of growing apples. It is a field in which I confess I have no ability myself, and I am willing to turn that whole matter over to those who know how to do it. I would rather take a smaller f. o. b. price in the fall than to take the chance of getting a little more for them out of storage or from consignment. Sell as soon as you can get a fair price, then start to raising next year's crop, is the way I feel about it.

As I told you last night, the cost of production with me has run about $1.15 a barrel. This is based on seven years' work. You cannot get at the cost of producing apples from the returns of one, two, or three years. My average net returns for seven years have been $2.65. This may not seem large to you, but remember that we are growing apples on a large scale for wholesale market, not retail. This is a fair return on the investment.

It seems to me that the outlook for apple growing in Virginia, as in Maine, is bright. The boom days are over. We are not going to hear many more reports of apple orchards selling for $1000 an acre. We must expect years of low prices, like 1914, every now and then. But the man who uses judgment in selecting a location and in the care of the orchard and who stays with it year after year should not have cause to regret his choice of business.

MR. SANDERS: In regard to the cost of heating orchards, I happened to make the statement incidentally, that the cost of heating orchards down in Nova Scotia—what was it you put your cost at, heating the orchards, per acre?

MR. FLETCHER: My understanding is that the cost of equipping an orchard with the type of heaters that are recommended today in the west, together with oil reservoirs, oil and labor, ordinarily would average about $50 an acre.

MR. SANDERS: I would not like my statement to go alongside of this without some explanation of my end of it. In Nova Scotia we get a tin heater for eleven cents each, which holds about two gallons, we put in one and one-half gallons of crude oil, costing six cents a gallon, using 35 to the acre. The labor we estimate about $2 an acre. In that way we get the cost of heating down to the price I mentioned, $5.50 an acre.

MR. FLETCHER: What result did you get from it?

MR. SANDERS: With 50 heaters to the acre we raised the temperature nine degrees. With 35 to the acre, we raised it from 29 to 34.

MR. FLETCHER: Fifty dollars an acre is the ordinary estimate in the west, to which I referred.

QUESTION BOX.

No. 46. Does it pay to pinch back the new growth of red raspberries in the summer?

PRESIDENT CONANT: I will say just a word on this subject, hoping somebody will volunteer some further information. I attempt to grow some small fruits. It seems that there are two systems of growing the red raspberry; one is called the straight cane and the other the lateral. Now, as I understand it, the pinching back of the new growth in the summer has a tendency to force laterals and in that way you get your lateral cane. Otherwise you would have the straight cane, to be headed back the following spring—which would naturally winter-kill a little and have to be cut back the following spring. My experience has been this, that whenever you pinch back a cane in the summer you force out this lateral growth, large lateral growth, which does not become ripened sufficiently, so but that we get a tremendous amount of winter injury. Ninety per cent of my canes producing laterals are ruined by winter injury every year, or have been for the last five years. So I practice the straight cane system, and in this way I have had very little trouble with winter injury of the red raspberry. I grow only the Cuthbert variety.

Has any other grower present had any experience along this line? If you have, please volunteer to give your experience.

Question: We have about an acre and a half of red raspberries and purple ones, which we put between the plum trees—can't cultivate them very much, and so we grow those in the line of the fruit trees—large trees. Last winter the raspberries winter-killed very badly. The red ones died back almost completely; injured them quite a good deal. Now, what I want to find out is whether it would do to prune those in the fall, or wait till spring? Which would be the best way?

MR. McALLISTER: Mr. President, I would like to ask the gentleman a question. What is your system of fertilizing?

Answer: Barn manure.

MR. McALLISTER: What time do you put it on?

Answer: We put it on in the spring, generally, though this year we started a new idea which we got up ourselves. We took about one-third part of our raspberry patch and put a fence of hen wire around it, and put our hens in there.

MR. CONANT: In reply to what this gentleman has said, with my experience, I would say this: Quite a number of small fruit growers have come to me this present summer and fall and asked me, "What success did you have with your raspberries this year?" My reply was that it was the only normal crop I produced on the farm. And inquiring of them what success they had had, in nearly every case winter injuries—winter-killing. My next question was, "What is your method of fertilization?" Barn dressing too late, late cultivation in the fall, and the canes were very vigorous and did not get ripened. Now, it seems to me, and my experience bears out this line, the only successful way to produce red raspberries is to fertilize with chemicals, using for your source of nitrogen, nitrate of soda almost wholly, and that applied early in the spring will become available before the middle of the summer, allowing the fall to harden and ripen your canes. For six years I have never lost any raspberry canes. I would not consider it, under my conditions, a safe proposition at all to use barn dressing or hen dressing or anything like that, where there is an excessive amount of nitrogen or ammonia to continue this growth. The canes must stop growing early in the fall and harden and ripen in good firm shape if you expect to get by in our cold winters. That is my idea after six or seven years' experience in growing raspberries.

MR. WYMAN: That is why I asked that question about cutting back. I think there is not any trouble about raspberries winter-killing (I have raised them for twenty years) if they are laid down in the fall. It is inconvenient to lay them down if they are not cut back so as to shorten the growth. Now, in regard to the fertilizer, I never would use barn manure on a bearing plantation. I want barn manure to grow the plants, and then after they come into bearing, use commercial fertilizer, and the best commercial fertilizer I have found was 400 pounds nitrate of soda, 400 pounds ground bone, 400 pounds muriate of potash, 800 pounds acid phosphate. That has given the best results.

MR. CONANT: I think this matter of fertilizing the canes, doing it early in the spring and maturing the canes, is the only safeguard against winter injury in 95 cases out of 100. Last season was a very hard season for small fruits.

Question: Do I understand you do not recommend hen manure for raspberries?

Answer: I would not do it—not for bearing canes.

Question: I have a friend with seven or eight acres, in New Bedford, Massachusetts, who has used that method altogether. He has had wonderful success.

MR. CONANT: That is under entirely different conditions. My idea of growing raspberries is to produce them at the lowest possible cost, as was said about the barrel of apples. Mr. Wyman buries his canes. I do not believe I can afford the time and the effort to cover the tops of the canes, and under my system of growing it is not necessary to do so.

No. 74. Name the best commercial varieties of (a) red raspberries; (b) black raspberries; (c) purple raspberries; (d) blackberries.

MR. CONANT: I am hardly able to answer that, although I have looked into the matter somewhat in regard to what were the most prolific and hardy varieties, and I find among growers throughout New England that the Herbert and the Cuthbert are the prevailing commercial varieties of red raspberries, the Herbert being perhaps a little hardier plant, but not so large a yielder as the Cuthbert.

No. 63. Should strawberries be set on fresh sod land?

MR. WYMAN: If you want them destroyed by white grub, set them on sod land.

No. 64. What is the best method of preparing the soil for strawberries?

MR. WYMAN: I would prefer a soil in the first place that has been planted the year before and cultivated, and then plow it in the fall and also in the spring, and have it well harrowed.

Question: I would like to ask one question in regard to strawberry growing. I am able to get a very good stand of plants in the matted row system and now I want to know the best method of fertilizing those strawberries. Should I put it on this fall, or wait till spring, and what should I put on? I want to get big berries. I have always been trying to get large berries. I do not succeed in getting the very largest ones. I have a very good stand.

MR. CONANT: Mr. Wyman, will you give the gentlemen your experience in fertilizing and managing a strawberry bed?

MR. WYMAN: My idea would be to use barn dressing, if you use it in the fall. I do not like barn dressing used in the spring. And then, the year that the plants are in bearing, use commercial fertilizer, if any.

MR. CONANT: Would you use nitrate of soda for your nitrogen?

MR. WYMAN: Yes.

No. 39. Should lime be used in the orchard?

MR. CONANT: Now, this may not seem an important question, but it is an important question, and I am glad the brother has asked this question. I will just give all the information I know about it, and then I want to throw it open. I put but very little lime in my orchard, but I have watched and read a great deal about liming the orchard. I listened, when in Connecticut last winter, to a talk by Dr. Wheeler who is considered an authority on lime and liming, and this question was asked of Dr. Wheeler. Should lime be used in the orchard, and how much?—something like that. And his reply came very readily, "Very little." Now, it seemed that he had been carrying on experiments along this very line, and he finds that in a majority of cases it is detrimental to the trees; that an orchard will thrive and do better under perhaps a slightly acid condition than it will with too much lime correcting the acidity, and he advised the growers to be very careful in applying lime in the orchard. There might be extreme cases where it would be advisable to lime the orchard, but to go very carefully, not putting too much lime in the orchard until he knew just what the condition was. This is a very important question. I would like to hear from others. I would like to have volunteer information from the various growers present. I am going to call on Mr. Keyser.

MR. KEYSER: I have not used lime direct. Where we use barnyard dressing in the orchard, we use, later in the season, basic slag, 500 pounds to the acre. That is our extent on the lime question. We use it with the idea of giving a balance to the dressing. But of course we all know that raising fruit with us on barnyard dressing, continually, more than once in three or four years, we cannot get colored fruit.

MR. FLETCHER: I think that the experiments that have been made on the use of lime for fruit trees, have shown conclusively that they do not need lime as do many crops. On the other hand, we must remember that a large body of the most successful commercial orchards in the country are in that great limestone belt stretching from Pennsylvania, western New York, down to Virginia and southerly, so that the apple tree is certainly tolerant of lime when present in its natural home. We must also remember that we cannot get a good stand, a good growth of the leguminous crops, especially red clover and crimson clover, unless there is a reasonable amount of lime in the soil, and, in these cases where lime is insufficient in the soil, it is a practice in Virginia to lime, specially, using the carbonate lime, sufficiently to make the soil sweet enough for the growth of legumes. We must have leguminous cover crops in the orchard and one is justified in liming sufficiently to get them, even though it may not be needed for the apple trees.

No. 41. Are bees necessary for largest yield of blossom crops?

Answer: I don't keep bees now. I have in years past, and I think they are a very essential thing to have on a fruit farm, for I know that when I had two or three swarms of bees we got more raspberries, and I think better raspberries, and I know well enough I got more apples than I do now. So I should say that bees would be profitable on a fruit farm.

MR. CONANT: I have heard this question brought up in several meetings. It seems about evenly divided. Some think it makes a very little difference whether bees are kept on the farm or not. Personally, I am not in a position to give any information on the subject, though I keep some bees, and I know that on the red raspberries and the fruit trees I get a very good set of fruit.

MR. WYMAN: I think, Mr. President, that it is profitable to have bees for the honey we get and also for the benefit they are to the berries. I know of a row of raspberries, less than ten rods long, where I counted 150 honey-bees on one side. I think they do some good.

DR. FLETCHER: I think it is known beyond any doubt that the pollen of the apple is not carried to any extent by the wind. It is only carried by insects. I am thoroughly satisfied in my own orchard, in which I have observed carefully, that it pays me each year to put, as I do, five or six colonies of bees in the middle of the orchard through the blossoming season. I usually lose at least half of these bees by poison in the blossoms. Ninety per cent of the blossoms drop off and I have to give a spraying while there are some belated blossoms on the trees, to which the bees come and get the poison which I have applied. I lose those bees. But I am satisfied I gain ten times over in the increased set of fruit, resulting from their effort.

No. 18. What are we going to use for fertilizers in our orchards the coming season?

MR. CONANT: This is a very timely question. It is a question many of us will not be able to settle at this time. However, I would like to hear from the various growers on this subject. Personally, I feel like this: We have had a wet season. Our trees are in splendid vigorous condition; they set heavily with fruit buds, made splendid growth and are in fine condition. In my particular case, knowing the conditions and methods of feeding, the practice in the past, I shall be very careful not to overfeed my trees this year. Consequently, I will probably reduce the amount per acre of fertilizer.

MR. MORSE: I think this is quite a question. We are planning to use barn dressing, as far as possible, instead of chemicals. We have been using chemical fertilizers, perhaps longer than any other orchardist in the state—fifteen years at least—and we have found that our trees do not seem to respond to its use as they did formerly. So far as the chemical is concerned we must wait and see what we can get.

No. 42. Is bird life to be encouraged by the grower of small fruits?

MR. WYMAN: I think, Mr. President, it should be encouraged by all means. They destroy lots of insects among our small fruits as well as the large fruits.

MR. CONANT: I am of the same opinion as Mr. Wyman. While they destroy more or less fruit, cherries and things like that, I think they do us a great deal more good than harm. I shall certainly do my best to increase the number of birds on my farm.

No. 49. What is an average yield per acre for red raspberries?

MR. WYMAN: I have been averaging mine, Mr. President, as near as I can get at it for a series of years. I find it is about 40 bushels to the acre.

Question: How many years?

MR. WYMAN: Well, I have gone back five years.

MR. CONANT: I have asked that question of large growers in Massachusetts and Connecticut, and they say from 1800 to 2000 quarts per acre. And I will say that is practically what my acre yields.

Question: What is the average price?

MR. CONANT: I am not in a position to give you those figures. We have the figures—the cost of harvesting the berries and what they brought, but we have not had time to figure to get the average net price per basket. It will probably be between nine and twelve cents a quart, against former years right round fourteen to fifteen. This has been a very hard year in Maine. The rainy season was on right at the picking time and berries would not stand up to ship, as they have in previous years, or as they normally do, consequently, did not bring the price in the markets that they otherwise would have. I think one of our largest growers in the state shipped half a car from our county, into perhaps this market here, and they were moldy when they arrived. You could not ship them any distance this year and have them reach the market looking fresh.

MR. ——————: We have had the same experience with mold. We shipped some to Jackson, N. H. When they arrived there they said they were quite moldy. But we shipped some to Fryeburg and they arrived in good shape and it was not so far to go. We sold them by the crate—12½ cents a quart box.

MR. CONANT: It certainly was a hard year to handle red raspberries, because it rained nearly every day through the picking season and the berries were water-logged and soft and would not keep any length of time.

COOPERATIVE MARKETING OF FARM PRODUCTS.

C. E. BASSETT, Office of Markets, United States Department of Agriculture.

Farming is something more than the mere producing of agricultural products, and to be successful, requires as much capacity and as much judgment as any commercial or industrial pursuit. Therefore, it should be not only an occupation but a business.

Heretofore, the farmer has almost entirely disregarded those things relating to the business end of his work, depending to a great extent upon his banker and the wholesale nandlers of farm products. Numerous agencies have done excellent work in placing farming upon a scientific basis, especially that which has been accomplished by the state agricultural colleges and experiment stations and the United States Department of Agriculture toward increasing the production of agricultural products and making farm life better. However, we have now reached a point where farming must be placed upon a business as well as a scientific footing. The problem confronting us today is not so much that of increasing our production as that we shall be able to dispose of that which we do produce at an equitable price. Both producer and consumer are complaining; the consumer, that he pays too much for that which comes to his table and the producer, that he is not receiving a fair price for that which he produces.

PRODUCTION IS ONLY HALF.

When a farmer has raised his crop he has accomplished but half his work; the other half, that of selling, determines his year's profits; and here in the marketing he comes face to face with his greatest problem.

The largest cotton crop, the largest corn crop in the history of our nation, have yielded the producers of these crops a less amount of profit than has been obtained in certain years of less production. Also during these years of heavy yield the prices paid by the consumers in most sections have not reflected in a proper degree the low prices paid to the farmers.

FAULTY DISTRIBUTION.

To the careful observer it is evident that there is a lack of an efficient system of distribution and marketing of agricultural products. While one market suffers from congestion caused by an oversupply, another may be suffering from a dearth, and at the same time tons of food products may be wasting in fields and orchards for want of a profitable market. It is a most common occurrence for one market to be glutted with a product while in another there is a scarcity—this condition applying particularly to highly perishable products which can not be placed in storage and held until there is a demand, nor shipped to some distant city where there is a market. Hence it is that we yearly have thousands of cars of agricultural products shipped into markets only to rot or be dumped, owing to the glutted condition at the time they are received. The remedy for this is a more equitable distribution.

As an example of our clumsy, inefficient method of distribution, the following example is cited: Steers raised in California by an Oregon operator have been shipped through Denver to Omaha and their beef sent to points on the Atlantic Coast, while Oregon and California points were importing beef from Chicago. Hogs raised in Illinois and sold at Indianapolis have been slaughtered in Boston and a part of their cured bacon shipped to Los Angeles, while Oregon hogs were being shipped to Omaha. Michigan dressed veal calves, *expressed* to South Water Street Commission Houses at Chicago, have been returned to the *identical* shipping points from which they came to fill orders from local retail meat markets.

INTERMEDIARY EXPENSES.

Some attribute our marketing difficulties to the presence of so many middle-men and speculators. These agencies have come into existence by the failure or inability of the farmer to perform these duties himself. If he is unable to personally distribute his crops and deal direct with the consumer or warehouse these crops until the market is ready to consume them, he must employ agents or commission men to do this work for him. It is no doubt true, however, that there are entirely too many middle-men engaged in the distribution of agricultural products. Under our present system of marketing some of these intermediary agents are a necessity, but a great number are a burden to both producer and consumer.

MARKETING DIFFERS FROM PRODUCTION.

The individual grower of agricultural products cannot stand on equal ground with the buyers of his products, in that he does not have the knowledge of market and crop conditions, nor selling experience sufficient to hold his own in striking a bargain. Production and marketing are essentially different and special ability is required to do either well. This is an age of specialization. All large commercial and industrial enterprises are divided into departments managed by experts in their given lines. The sales departments have their sales agents who have spent years in study in order to become expert salesmen; purchasing departments have their expert buyers, while the factory or producing end has another corps of experts.

The necessity of separating the producing force from the selling force has been realized by manufacturing concerns. Why is it not necessary to separate the producing from the selling force in agriculture? The farmer is a specialist in production and generally not skilled in marketing.

COÖPERATIVE PLAN.

A new faith has developed on the part of the American farmer, that the coöperative plan of doing farm business is the most satisfactory method. In fact, the American farmer is being driven to coöperation by necessity. While we hear considerable of the extent to which coöperation in the marketing of agricultural products has been carried on in foreign countries, such as Belgium, Germany, Ireland, Denmark and others, from investigations which have been carried on by the Office of Markets and rural Organization, it has been found that there are over 8,000 organizations in this country which are coöperative or owned by producers engaged in the marketing of agricultural products and in the purchasing of farm supplies. Over a billion dollars' worth of products will be marketed by these organizations this year. From this it will be seen that American farmers are beginning to realize that by selling coöperatively they will not only be able to offer a standardized product and reduce the cost of marketing, but they will be able to furnish this better article to the consumer at the same, or even at a lower price, thus stimulating consumption. In fact, any system of marketing that does not give better service or better prices to the consumer and at the same time secure for the producer a greater net return, is founded on improper principles.

WORK OF AN ORGANIZATION.

Coöperation in the marketing of agricultural products include the establishment of grades and standards and, where possible, the adoption of brands and trade marks, the securing of capital and credit, proper advertising to encourage consumption of the meritorious but little known product, discovery of new and extension of old markets, securing information as to crop and marketing conditions, the equitable division of profits, adapting production to meet market requirements and the utilization of by-products, securing cold and common storage facilities, the coöperative buying and manufacturing of supplies, securing of lower freight rates, more equitable refrigeration charges and more efficient transportation service, the securing of more and better labor and the general cultivation of a spirit of coöperation and uplift in all community affairs. Strange as it may seem, there are many who prefer to ship their products to a distant market, of which they know practically nothing, to be handled by some firm of whom they know less, rather than to have their property marketed by a competent manager of their own selection. Farming communities coöperate to secure better churches, better local government and better schools. If they are willing to leave their religion, their politics and the education of their children to coöperation, there certainly should be no hesitation in leaving the marketing of their farm crops to a coöperative system that has passed the experimental stage. Coöperation is the act of working with others for the common benefit. This means that all must work and all should share in the benefits in proportion to the support given by each to the enterprise. In coöperative purchasing and marketing associations a certain amount of capital may be necessary and those who furnish it must be paid for its use. Since the profits of the business come from the patronage, either on goods bought or sold or services rendered, they should be divided on this basis rather than on the amount of capital invested. In this respect coöperative organizations differ from ordinary business corporations, which are formed for the purpose of making as great a money return as possible on the capital invested. As in the nation, each citizen is entitled to one vote, so in a coöperative association members usually stand on a voting equality, each member having an equal voice in the affairs of the organization. This prevents control by a few individuals. Members should be bona fide producers. The development of the enterprise should come from within as a natural growth and the professional promoter should be scanned with caution. At the outset small local organizations are safest, but these in turn should federate for greater efficiency. Examples of successful federation are found in the fruit associations of the Pacific north west and California, where as many as 120 small local associations are federated into district exchanges, they in turn being affiliated with a large central selling agency. The first farmers' coöperative elevator was not formed until the old line companies, aided by the railroads, had driven the prices of grain to such a point that farmers were receiving prices fixed and controlled by a set of interests which were driving the producers of grain out of business. It was out of desperation that the coöperative movement was started, which has grown until now we have over 2,500 farmers and coöperative elevators in this country.

NECESSITY.

The producers of perishables that are grown a great distance from consuming markets were driven to coöperation by necessity. The perishable nature of their products and the heavy transportation expense have compelled them to organize and stay organized in order to distribute and market their products in competition with points nearer the consuming centers. Such a condition as this accounts for the highly efficient organizations found in the Pacific northwest and California.

A study of coöperation in this country brings us to the conclusion that coöperation as applied to the distribution and marketing of farm products is not successful, as a rule, unless it is founded upon dire necessity. So long as farmers do fairly well in their own way they are not inclined to coöperate.

That section which makes a specialty of some one phase of agriculture offers the most promising field for coöperation as it gives the association the advantage of a large amount of one product, such as coöperative elevators for handling grain, livestock shipping associations, meat packing houses, coöperative creameries and cheese factories, egg circles, cotton gins, cotton warehouses, fruit and produce associations, and various others.

One of the most difficult problems in marketing is to build up the trade in a little of about everything that is raised on the general farm and maturing in small quantities at different times. Coöperation therefore is more successful when adapted to the marketing of highly specialized and localized crops.

INCORPORATION.

In organizing an association the basic principles as enumerated above should be embodied and the association should be incorporated under the laws of the state in which it will operate.

Some states have a law that fosters coöperation in that it is possible to organize a nonprofit business enterprise under a special coöperative law, while in others it is necessary for the association to be chartered under the regular state corporation law in which case considerable difficulty is experienced in conducting the business on strictly coöperative lines. Various states, however, are realizing the necessity for a law which will allow the formation of farmers' organizations along strict coöperative lines and each year sees the passage of new laws permitting the formation of these organizations. By being chartered under the state laws members and the association are protected by limiting their respective powers, duties and responsibilities.

The plan of operation must be suited to the local conditions and the mere fact that a certain plan has been successfully applied in one section does not warrant the conclusion that it can be copied for some other, as the conditions may be entirely different. It is far more practicable to mold the organization to fit the circumstances. The products to be handled, the location of markets, the functions to be performed, and the character of the farmers to be organized, are important determining factors that must have serious consideration in the plans adopted.

CAPABLE MANAGEMENT.

One of the most important essentials for success is capable management. The man placed in charge of a coöperative organization should not only have had experience, but he must be intelligent, diligent and of good judgment, with tact and ability for keeping alive the enthusiasm, interest and coöperation of the members. Inefficient management has been responsible for a great many of the failures of coöperative organizations. The manager should be employed by the board of directors and should have power to employ and discharge labor and secure information as to crop and market conditions, furnishing the same to the members upon request. He should encourage production of the best varieties of products demanded by the trade and aid the growers in every way possible, bringing up the standard of their products to the highest point. He should enter in to contracts for the sale of all association goods and should have entire charge of the marketing of the same, subject only to the action of the board of directors, by-laws and rules of the association. Expenses of operating the association may be met by a percentage on returns for produce sold or by a fixed price per package, the amount of such charge to be fixed by the directors.

COÖPERATIVE PURCHASING.

While many large organizations furnish supplies to members on credit, with ample security, in most cases the merchandise purchased by the association for the use of its members should be paid for in cash in advance or on delivery. Any system of extending unprotected credit requires large capital and often results in considerable loss. Western organizations, however, have built up a system of furnishing supplies to growers throughout the season, these being paid for from the returns of the growers' products shipped through the association. Some fruit associations have carried this financing of the growers one step further and made liberal advances for protective purposes such as labor, water rents, taxes, etc. In these cases crop mortgages are given by the grower to the association as security for such advances. An organization to allow credit to members and not sustain considerable loss should be in a position to collect all accounts due. New associations will make a great mistake in allowing liberal credit. Good security should always be held by the organization for all advances made to growers.

MEMBERSHIP AGREEMENT.

A farmers' organization must of necessity be conducted strictly upon business lines. This requires an agreement setting forth the relationship between the member and the association. Without such an agreement an organization lacks stability and rarely succeeds. This is sometimes provided by the signature to by-laws or a contract between the members or by a written contract between each member and the organization. According to law, each member must reserve to himself the right to fix the selling price of his own products, though he may not exercise that right, as a matter of fact.

Farm products should be graded in accordance with specified standards, established by the association, and an effort should be made to secure greater uniformity in quality and to provide for the enforcement of standards that will furnish a common language between consumer and producer and thus tend to place farm products upon a stable basis in the markets. This applies particularly to perishables. It is essential that the purchaser of a given product may know within reasonable limits what the seller proposes to deliver at a given price and it is impossible to rationally fix prices without such knowledge.

GRADING AND PACKING.

It has been stated that farmers as a class are not competent to pack their own products. As a rule they have neither the facilities nor the time to prepare their products properly for market and the conclusion is that coöperation is necessary to bring to uniformity any grade and pack. Certainly such uniformity is exceedingly necessary for successful coöperation. The security of a uniform grade and pack by a coöperative organization requires a good system of inspection.

BONDING AND AUDITING.

As a matter of protection and to hold the confidence of the members, it is essential the officers and other employees handling organization funds be bonded and that proper systems of accounting records be kept and frequent audits by competent outside parties be made.

DIVISION OF PROFITS.

Of the profits made from the year's operation of a coöperative organization, stockholders, in case the organization is founded upon a stock basis, should receive the local rate of interest on the par value of their stock. Part of the balance should be set aside as a surplus fund to increase the working capital or to finance further improvements. The remaining amounts should be divided among the members in proportion to the value of their shipments and purchases made through the association during the year. There should be some provision whereby any member who has failed during the season to live up to his agreement, by not shipping exclusively through the association or by any other breach of his contract, and provided further that this failure has resulted in a loss or damage to the association; then the defaulting member should forfeit to the organization such a sum as would reimburse the association for the loss or damages thus sustained. Some form of a binding contract is essential to hold the members of the association together. Many an organization has failed because members were only bound by a gentleman's agreement. Such a membership is totally inadequate for a stable and long-enduring organization.

POOLING.

Thorough-going agricultural coöperation naturally suggests the pooling of interests. Growers who ship like grades of the same products during a given time, should receive like returns as a matter of justice, although the shipments of one may have sold at a high price because of the good fortune of arriving at a good market, whereas the shipment of another may have suffered great loss from conditions over which the grower and organization had no control. Pooling of interests practically elminates the element of chance in so far as the individual is concerned and tends to secure the satisfaction of all. However, without uniform grades, it is not just to pool shipments.

UTILIZATION OF BY-PRODUCTS.

It should be the purpose of a coöperative marketing organization to work out all possible economics in the industry of which it is a part. This suggests the utilization of by-products. Under the very best agricultural methods there is always a percentage of the crop that will not grade sufficiently high to justify shipment. The cotton seed industry is founded upon a by-product. The preservation of dropped and culled fruits has come to be an industry within itself. The savings to the farmers from canneries, meat packing houses, preserving houses, pickling factories and cider mills, is very great, but considering the fact that in a recent year, according to estimates, 100,000 carloads of agricultural products went to waste in the United States, the conclusion is inevitable that the utilization of by-products of the farm has been accomplished to an exceedingly limited extent.

COÖPERATION OF MEMBERS.

Of all things necessary to the success of a coöperative enterprise, the coöperation of the members is the most essential. A disloyal member is the chief element of failure in coöperative circles. The most capable officers, managers and agents cannot be expected to succeed in handling the affairs of organizations unless they receive the full strength of the members' patronage and their complete moral support.

OUTSIDE INTERFERENCE.

As soon as a coöperative organization is formed, individuals who have formerly reaped the benefits from the farmers' trade, such as outside buyers and occasionally local dealers where supplies have been purchased, will often do everything possible to disrupt the organization. Higher prices than it is possible for the association to obtain for commodities will be offered the producer in the hope that he will accept them, thus drawing his support from the association. It is necessary for the members of the organization to unite with the determination to put forth every effort to make it a success and loyally support it against all outside influence.

Coöperation as an economic principle is receiving the serious consideration of practically all industrial classes. Its application to special features of agricultural distribution and marketing is entirely feasible and offers a solution of problems and difficulties that are practically hopeless in so far as the individual is concerned.

Coöperative marketing is a business enterprise and its success depends upon the loyal support at all times of the members and the efficiency of the management. The reputation of an association for furnishing goods of a dependable quality will establish a trade confidence which is its greatest asset.

Where the producers of a community possess that neighborly feeling which makes each willing to "give and take" a little, for the good of all, there is the spot where the true spirit of coöperation has already found a home and where its people may hope to develop a successful community coöperative business association.

COST OF AN APPLE.

Dr. G. M. Twitchell, Monmouth.

Mr. President: It is said that the average New England farmer would rather lose one dollar than see his neighbor win two. Whether or not that is true, I wish that every farmer in the State of Maine, every producer of apples and other farm products for the markets, might have heard the clear, terse, straightforward statements made by the speaker this morning. Because it seems to me he has touched the very heart of the problem which we are working over in this state and trying to solve or to approach a solution.

The farmers of the State of Maine and of New England have been having a hard time this year and they are not, perhaps, in just the frame of mind to listen to a discussion of questions as they might be under more favorable circumstances. It seems to me that they are somewhat in the position of the little boy in school when the teacher called out the class and said, "Now, children, I want each one of you to tell me what you have to thank God for." Commencing at the head, the first boy thanked him for a good father, the next one for a good mother, another for his sisters and brothers, finally coming to the foot of the class where there stood a little boy who was all twisted and deformed, cross-eyed, hook-nosed, etc. "Jim, what have you got to thank God for?" He hesitated a moment and then he said, "I don't know as I have got anything to thank God for. He has just about ruined me."

I don't know as the farmers have very much to be thankful for today, in view of the crop conditions which we have been meeting. Yet, as I go about among them, I hear no complaints. If any other industry, any other class had met what the farmers have met this year, there would have been an extra session of the legislature called for state aid before this time. Go where you will. you hear no complaints, just that sturdy holding on in faith, believing that next year things are coming better.

How are we to determine the worth of an apple tree? Mr. Bassett has covered that question along the line that I want to discuss for a few moments. I ask the manufacturer of shoes in the city of Auburn what it costs to produce a pair of shoes and he tells me. I say, "Do you know that is correct?" and he says, "Why, I have to know. The margin of profit is so small that in no other way could we conduct our business. I must know to a nicety." I ask the agent of a cotton mill what it costs to produce a yard of cotton cloth, and if he knows what it costs. He says, "Certainly, I have to know what it costs, when the profits are so far down in the fraction of a mill in a given yard that the slightest mistake on my part would cause loss and I would lose my job. We must pay our expenses. We must have dividends for our stockholders, and, therefore, I must know what it costs me to produce."

Mr. Bassett said that good business necessitates that condition, and that applies as well to the farmer as to the manufacturer. Are we ready to accept his statement, friends? Do we believe that the same business relation, which governs in other lines of industry, holds with the farm? Unless we do, it seems to me that it is folly for us to discuss the question of the cost of an apple. Because one thing is true, the same business law which governs in the mill or factory governs upon the farm, or else there must be a law peculiar to agriculture, as rigid, as exacting, which we must seek and find the application of. Accept one or the other, we must. I believe that it is the same general law, and that for us to find success in our work we must first determine the cost of production of the products we are getting.

I have been trying to solve that problem for myself for a series of years. There are things necessary for us to see—things that we have not been seeing in the past. It is necessary to take account of items which we have not previously been figuring. I have been asking farmers, for years, as to the cost of producing a barrel of apples. The answer has been invariably, "It costs me fifty cents." The boom days have gone in orcharding. So much we have to be thankful for. We have settled down to business. No longer are men going out and buying what they term deserted, neglected farms, and planting great orchard propositions, and then going back to their city homes and expecting to reap a harvest therefrom.

Some of you know that for the past eight years I have been upon a small piece of land, with a few trees, having a good time, enjoying myself as I never did before, finding a life that I never dared dream possible, and I have also been trying to solve the cost, in the various experiments I have been carrying forward, in the work I have been trying to do. I have been trying to find what each department costs, keeping an itemized account of everything I am doing and charging up everything at prices which I have to pay for work. If I work with a man a day I charge the same as I pay the man. Everything that I have been doing has been figured on the basis of $2 a day for a man and $1 for a horse.

Starting with that little proposition in 1908, with a lot of old neglected trees, in bad shape, as some of you know, I began the work of reconstruction. Pruning the first year consisted in cutting the dead wood, water shoots and suckers and digging out the borers. Twice a year, about June 15 to 20 and August 15 to 20, a man goes over those trees with a magnifying glass and looks carefully and thoroughly for the borers. I find it profitable to make that second trip, because then the borers have hatched and are about one-sixteenth of an inch long and have just commenced working into the outer bark, so they are easily gotten out. Those that are left, if any escape, are gotten out the next spring, in June, when one will find their chips. In that way we practically cleared those trees of that pest. It cost me 29 cents that year. I used ten pounds of Fisher formula fertilizer per tree, at a cost of 26 cents, and cut the grass under the trees at a cost of three cents. In 1909, the pruning was more thorough and cost me 30 cents; fertilizer, 25 cents; sprayed once at a cost of four cents; cutting grass, three cents; total, 62 cents. In 1910, pruning, ten cents; fertilizer, 17 cents—I changed to a formula made of chemicals carrying four and one-half per cent nitrogen, eight-ninths phosphoric acid, seven and one-half potash—ten pounds to the tree; cutting grass, three cents. That year I sprayed the trees and washed them with a lime wash, 17 cents; sprayed twice, 12 cents; and the cost for the year was 59 cents. In 1911, pruning and digging borers, ten cents; fertilizing, 17 cents; spraying three times, 17 cents; cutting grass, three cents; total, 47 cents. In 1912, pruning and digging borers, 12 cents; fertilizing, 19 cents—I increased to 12 pounds that year, per tree; spraying, 17 cents; cutting grass, three cents; total, 51 cents. In 1913, digging borers and pruning was but seven cents; fertilizer, 20 cents; spraying three times, 19½ cents—that year I used, in addition to my regular spray solution, Black Leaf 40 for the aphis; cutting grass, three cents; total, 49½ cents. In 1914, pruning and digging borers, seven cents; fertilizing, 20 cents; spraying three times, 19 cents; cutting grass, three cents. Under part of these trees I mulched with a second crop. I could not sell, and have charged here just the labor, ten cents; total, 59 cents. This year, pruning and digging borers, nine cents; fertilizing, 19 cents; spraying, 20½ cents; cutting grass, two cents; ten cents for labor in mulching again this year with the second crop; total, 60½ cents. This is an average for eight years of 55¼ cents, counting every item of cost, and keeping a most accurate record of all time spent.

But that does not cover the cost. What is the value of an apple tree in bearing condition? I have figured it upon the basis of $10; six per cent on $10 is 60 cents, which must be charged. The depreciation is two per cent. Some say that I am wrong there—that I have so improved those trees that I should not charge anything for depreciation. Others say that an orchard that is in a healthy condition can be kept so without any loss. But I find that there is loss. At any rate, I find that it is a practice which holds in all business. I am coming back to the statement of Mr. Bassett, that business laws must hold here as well as elsewhere. Every sound business man is setting aside a sum every year for depreciation, for a sinking fund, that when the time comes when he needs a new mill or new machinery, he has something to draw from, out of the business. And, therefore, in this case it must be charged up to the apples upon the trees, and I have charged two per cent, that is, 20 cents. I have charged two per cent for depreciation of machinery, etc., 20 cents; two per cent for taxes at $100 per acre which would be five cents per tree, 40 trees to the acre, and I have a total there of $1.60¼ as the cost to me when I am ready to pack the fruit. Now the barrels cost me 36 cents; two cents to move the barrels to the orchard; two cents to move the apples from the orchard to the storehouse, a barn across the way; three cents to move the apples from the barn to the station for shipment; 18 cents to pick. There is 66 cents more to be added to the cost of the apples—the

$1.60¼ is per tree. Vary those figures as you will, of course, under different conditions, the fact still remains that those items have all to be counted. They are all in the wash somewhere. When a man says to me, "I don't charge anything for my team, I have to keep a team anyway," he is not honest with himself. Unless we can make this business pay all these charges and give fair returns upon the investment, we better get out of it, it seems to me. I have here 60 cents per tree, interest money, which, allowing 40 trees to the acre, gives $24 an acre, and this makes a good investment. If I could grow apples upon a large scale, pay these charges which I have indicated here and sell the apples to cover same, I have a good business because I have my six per cent on my investment, and it pays.

If the yield is but one barrel a tree, and that is as good as we are now getting in the State of Maine, you see where we find ourselves as business men. Take the lean years with the fat, take every poor tree in the orchard as we must, count the whole of them, and while individual cases that I know of have exceeded this, yet I believe that I am safe in saying that the average of the State of Maine does not exceed one barrel per tree. I have one tree that has averaged two barrels and three-quarters for five years; and there is another in the same row, as large, seemingly as flourishing and as healthy, that never has produced a barrel in any one year. I wish somebody could tell me why. I don't know. I have puzzled over that tree to find, if I could, the cause. There is a Baldwin tree in the field that has not produced over half a barrel in any year since I have been there. Another has given me an average of almost two and one-half barrels. Now I have to count those poor bearing trees with the others. It would not be wise for me to take that good bearing tree as the measure of production, but I must count every tree that is in bearing condition. Then I have to count the lean years with the fat. There is an orchard across the lake, a mile and a half from me, that last year produced 1350 barrels of apples, and this year 90—a few years ago 2000, later 30. How are you going to figure the business?

We have bulletins, giving the cost of production of last year's crop, which are misleading, because last year's crop was an abnormal one. See where we are this year. The town of Monmouth last year shipped between forty-five and fifty thousand barrels of apples; this year it won't ship ten. How are we going to figure the production of our orchards. Upon either year? No, but take an average of ten years. I have only eight, and therefore my figures are not complete yet. My proposition is only a small one, I know, but still I have been keeping these figures to find out, if I can, what I am doing, and I am ready to stand behind the proposition.

All this being so, what is the first thing a man faces in the business? He settles down to this question of cost of production and says there are three things to do. I must increase production per unit, I must reduce cost and I must improve quality. Am I not right? I know of no other incentive, no other place for us to find the incentive. We have been told, and we know, that our apples are not as good as they ought to be. Go into the stores anywhere in the State of Maine and you will find the Oregon apples, or the extreme western apples, in the market. You ask for Maine apples, and they may have some; if so, they are in a box or barrel back somewhere and you do not like the looks of them. Remember that nine-tenths of all Maine apples are sold by the growers to be packed by the buyers, therefore the farmer is not responsible for the pack of that barrel.

We must find the incentive, brothers, which will force us to study these three points I have indicated, applicable in the business world, and certainly with us. How may I increase production of my trees? How may I improve the quality of the fruit? How may I at the same time reduce the cost to me? Those are the three great questions which confront us and which surely must be solved. While studying this question of quality we should eliminate varieties which have been popular in the past and are not today. We have wiped out in the premiums of recent years varieties like the Black Oxford. As years pass others will have to go, because they have had their day and have lost hold on the consuming public. We must give more attention to those varieties which the market wants. I am just going over the ground which Mr. Bassett emphasized—those varieties which the buyer wants, for what pleases the eye satisfies the consumer. There are only three or four varieties that are popular—the Baldwin, the McIntosh Red, the Greening and the Northern Spy, where it can grow to perfection.

We have been meeting a condition in the Northern Spy, this year, which we have not met in the past—that hard, woody condition all through the apple. We have also been meeting, this year, pests we never knew of before. One of our noted naturalists, in a book lately published, makes the statement that the next great war that is fought in this country is not going to be man against man, but man against the pests. In that work we have presented facts which are startling and which claim our attention. Surely, we must give more attention to pests in the future than we have in the past, if we are to grow the quality of fruit which would be above the standard of today, as it must be in order to make this a good business proposition.

So these three points I want just to leave with you as the three which are to be emphasized, and which the study of the question of cost will force us, I believe, to investigate more critically than we have in the past. Find the cost of production and, finding that, find the incentive to investigate more thoroughly, more carefully and more critically how we can improve the quality, how we can increase the yield, how we can reduce the cost. And I believe by so doing we will eliminate the multitudinous number of varieties which are today to be found in so many orchards, and we will be getting down towards that business basis which means the growing of those which are most popular, most uniform in quality, best adapted to our locality, and for which the buyers are ready to pay the highest price. Where the Northern Spy can be grown in its perfection, there is no apple that can exceed it as a popular variety.

I think I have covered the points, Mr. President, that I wanted to bring to you. I do believe that this question of cost of production, which we have not touched in the past as we must in the future, is one that confronts every man, and while some may say it does not cost me any such sum to do my work, yet I want to ask today how many men have been keeping, for a series of years, an accurate account of the cost of production by hours or days of men and team, the cost of items of spraying —how many? Until we do this, do you not see it is simply a matter of guess-work with us. We must get right down in this business and find out, and finding, I believe we then have found the incentive for future work of growth and improvement, and will find also that we have a saner and a safer business than we realize today.

In any attempt to solve the problem of cost or possible profit, more attention must be given to increase of that variety which finds in our soil its most favorable environment. Never mind if actual experiments must be made on every farm to finally decide this problem, it lies so close to the pocket book of the grower that its importance cannot be overlooked. Make the environment of your trees so congenial that they may be incited to do their best and the problem of profitable orcharding will be solved.

OUTGO AND INCOME OF A TEN-ACRE APPLE ORCHARD.

PROF. U. P. HEDRICK, Horticulturist, Geneva Experiment Station, Geneva, N. Y.

I take it that you men before me are all growing fruit for the money you can make. In common parlance you are business men. Yet in this day, in which efficiency is the slogan of business, how many of you have precise knowledge of what your capital and labor are accomplishing? How many figure accurately profits and losses? If making money, how many can find the goose that lays the golden eggs? If losing, how many can locate the leak? How many have made a physical valuation of the property in his possession and actually know his assets and liabilities? At the risk of being thought presumptuous I venture to say that not many in this audience can give anything like a clear statement of the financial condition of their business. Yet I do not believe that any one of you is wilfully negligent of your money matters, but, lacking data with which to start and method with which to keep track of the outgo and income of your orchard, life spins past with your business affairs in a tangled skein which you hardly dare attempt to unravel.

No doubt before me are a number of men from city or town who are planting orchards—beginners embarking upon what seems to be a pleasing hobby and yet one capable of giving a living and an income for old age. Possibly all will go well. It is to be hoped that your castles in the air will materialize, but if your venture is founded on the figures you have seen in some of the mushroom magazines, or on the occasional phenomenal crops that nearly every orchard bears, the chances are you will find the times out of joint long before your plantings come into bearing and will take to building aerial castles in some other profession. You will learn through experiences dearly paid for that many of the cocksure statements you have read or heard are but the stuff dreams are made out of; that figures often pass through the transformation that Alice in Wonderland underwent when she drank from the magic bottle and immediately grew to gigantic proportion. Thousands of newly-fledged fruit-growers, the country over, who are now drawing checks on the bank of expectancy, will leave money rather than take it from the field of horticulture. You and they might not thus have been deluded had there been anywhere a substantial body of figures from which could have been obtained a true conception of the financial conditions of fruit-growing.

We are well justified in saying that with increasing competition, manifold uncertainties in orchard conditions and unbusinesslike administration, fruit-growing is becoming a more and more risky business. In the hands of the careless and uninformed it is likely to prove as unstable as a house of cards. Of all this you need to be reminded rather than informed; for, experience and the teachings of years have given the old hands among you, at least, knowledge of the uncertainties in growing fruit and now, everywhere we are hearing discussions of the business side of the industry. Temporarily the "idea of making two blades of grass grow where one grew before," with which agriculture has been chiefly concerned in the immediate past, is eclipsed by the conception, just beginning to be realized, that agriculture is a rather highly developed enterprise requiring for success careful business management. We are beginning to realize, too, that in neither the art of production nor in the business management are the difficulties transient troubles to be solved once for all; rather they are permanent problems made more urgent daily by new complications and keener competition.

Coming now to the subject of my paper, "The Outgo and Income of a Ten-Acre Apple Orchard," I have to say that it is presented with the hope that it may prove a helpful contribution to those who want data on the cost of producing apples and on the yields, selling price and profits in the culture of this fruit. I hasten to say that you must not expect anything like a full consideration of the subject. Neither time nor material suffice for that; for, keeping accounts in apple-growing is a difficult and complicated piece of business. The yearly inventory and striking of balances, which do very well for the grocer and butcher, do not begin to tell the whole story in fruit-growing. In growing apples, for instance, it takes several years to bring an orchard in bearing, after which it barely maintains itself for a decade or two; the lean years and fat years are more accentuated than in most other industries; advantages and disadvantages are exceedingly changeable; and the value of the investment is variable. Indeed, fruit-growing is not far removed from gambling pure and simple, and I imagine a gambler has trouble in keeping accounts.

The only possible way to obtain an absolutely accurate reckoning of the profits and losses of an apple orchard is to add the expenses for the whole life of the trees and subtract from the total income; the remainder, if plus, is the profits; if minus, as will be most often the case, the losses. This plan might have been feasible for Methuselah, with his 969 years, but in our short span of life it will not work. Since annual accountings are not fair, and total ones not possible, we must divide the life of the orchard into periods and take data for each division. In this region, where the apple lives as long as man, we may make from the life of an orchard seven periods of a decade each, similar to the seven ages which Shakespeare allotted to man. The seven periods ought to make very fair units for the collection of data.

Unfortunately we do not have for any one of the seven periods much accurate data either as to the average total cost of production or the cost of any one of the several orchard operations, nor do we know much about the average cost of the materials used in orcharding, or the average selling price of the produce of the orchard. Now the value of such data is obvious to those of you who are making any attempt to keep track of the finances of your business, and the object of the present paper is to put you in possession of figures that, rightly used, ought to be helpful. I say rightly used, because most figures are capable of several interpretations and all are subject to the lapses and mistakes common to erring mortals.

The fruit to be considered is the apple as grown in our orchard, situated a few miles west of Rochester, New York. Added value is given to the figures I have to present, by the fact that the orchard was selected for experimental work because it was as typical as could be found of the great apple belt of western New York. The trees are Baldwins, twenty-seven years old at the beginning of the experiment, thirty-seven now. Our accounts tell what each of the orchard operations has cost, the number of bushels of fruit produced and the selling price. In short, we think we have something substantial to show what the outgo and income of a New York apple orchard is in the fourth decade of its life, the period just preceding prime of life. We shall give the data, as far as possible, for three units, the barrel of apples, the tree and the acre.

The first information we must have in getting at a problem is the number of barrels of apples per acre, per year. The exact number for the cultivated plat in this ten-year average is 116.8 barrels. Graded, the acre average for the period is 79.2 for barreled stock; 37.6 barrels of evaporator and cider stock. Reducing these figures to the tree unit we have for barrel stock 2.93; for evaporator stock 1.4. Total per tree, 4.33 barrels. The proportion of evaporator and cider stock is seemingly high—made so by two autumn gales, in different seasons, which gave many windfalls. Such episodes come in the life of every orchard. Yields per acre will vary greatly with the same variety in different orchards, even in the same section, but there is little reason to think that the ten-year acre average just given is much above the mark for orchards that are cared for—well tilled, sprayed and pruned plantations. It is, of course, much greater than the average yield of Baldwins in New York for the reason that fully half of our orchards, to the shame of the state, are wholly or partially neglected.

The first item in cost of production to be considered is interest on investment, and we come at once to an entry in our account over which there can be much disagreement. What is a Baldwin orchard in full bearing, in the prime of life, worth? Sales are too few, and most of those that take place are made under conditions too abnormal to make selling price a safe gauge of value. Suppose we make the value $500 per acre and call the interest five per cent. This valuation is not high, for it includes not only cost of land, trees and labor for the deferred dividends of the first twelve or fifteen years. It is sufficient, too, to cover the overhead expenses of houses and barns—or, at least, the share of these charges that would fall to a ten-acre orchard in New York. Our first expense item, then, is $25 per acre on investment, a sum which, divided by 116.8, the number of barrels per acre, gives us a charge per barrel of twenty-one cents as interest on investment.

Taxes vary greatly in different counties as they do somewhat in different years in the same county. Since this orchard is but a part of a general farm, we can only estimate the cost of taxes. There are few regions or years in New York in which taxes for such an orchard would be over $1.50 an acre, making the tax on each barrel of apples 1.2 cents.

The next account to be charged to cost of production is depreciation in teams and tools, and interest on the money invested in them. First-class machinery for running the average orchard will cost in the neighborhood of $1,000, the items being as follows: Teams $400, spraying outfit $250, harness $50, wagon $75, plow, harrows, ladders, crates, pruning tools, etc., $115. The figures named are below rather than above average prices, but there are few instances, indeed, in which the tools and teams named would be used exclusively for a ten-acre orchard. If we set the depreciation and interest on money at 20 per cent for the above equipment we must add seventeen cents per barrel of apples to the depreciation account. Take notice that in obtaining the cost of production in the orchard under discussion the depreciation account must be thrown out for the Station hired all work done and the workmen furnished their own teams and tools. This item is put in, then, only as an approximation of what men who are doing their own work must charge for depreciation.

Passing now to orchard operations we find that the annual cost of tillage per acre for the decade was $7.39, making the amount to be charged against each barrel of fruit 6.3 cents. Tillage consisted, in this orchard, of plowing the ground in the spring, after which it was harrowed, rolled and then cultivated by harrowing an average of seven times per season. The price paid for team work at the beginning of the period was $4 per day of ten hours; but the price advanced to $5, a fair average being $4.50. Tillage includes the labor of putting in the cover crop but not the cost of the seed. For the cover crop seed, in this orchard usually red clover, must be added $2.74 per acre for seed or 2.3 cents per barrel of apples.

The expense of pruning per year per acre was $3.56—since there are twenty-seven trees to the acre in this orchard the cost per tree was 13.1 cents. The cost per barrel of apples was three cents. The average price paid for the work was $2 per day of ten hours.

The average cost per acre for spraying was $11.28; per tree 41.8 cents; per barrel of apples 9.6 cents. The spraying was done the first few years with a hand sprayer, then, for several years, with a Niagara gas sprayer, and the last three with a gasoline power outfit having two runs of hose. The first five years Bordeaux mixture and arsenite of lime were used; the last five, lime and sulphur and arsenate of lead. Now I come to a statement which I would hardly dare make in the presence of the plant pathologists and entomologists. The orchard was sprayed three times per season the first five of the ten seasons. The second five years it was sprayed but twice per season, the first application being the dormant spray made just before buds began to swell; the second, just as blossoms dropped. This treatment has given an almost perfect crop, wormy and scabby apples being rarities scarcely to be found in the orchard.

The last of the cost of production charges is that of superintending the work. The services of the average fruit-grower are worth more than the $2 per day, allowed for actual work, and this deficiency should be made up by a charge for superintending the work. The Station paid for this service $300 per year. This, in my opinion, is a fair price, since there are few competent orchardists who could not superintend a farm enterprise of several times the magnitude of a ten-acre orchard. The charge to be entered against a barrel of apples, then, for superintending is twenty-five cents; against the acre unit, $30; against an apple tree, $1.10.

Picking, packing, sorting and hauling have been done in diverse ways during the ten years and the items cannot be segregated. But the total cost of these operations has been 24.4 cents per barrel. The apples, it should be said, were sorted and packed in the field. The crop was hauled to the Station, one and one-half miles away, over a country road not better than the average.

The following is a summary of the cost sheet for a barrel of apples:

Interest on investment	$ .21
Taxes	.012
Tilling	.063
Pruning	.03
Spraying	.096
Cover crop	.023
Superintending orchard	.25
Picking, packing, sorting and hauling	.244
	.93

All of the first and second apples from this orchard have been packed in barrels. The average price of barrels for ten years has been thirty-six cents each, the price having fluctuated from thirty to forty cents. The culls have been handled in crates and a charge for packages cannot be entered against them. Adding the cost of the barrel to the cost of production we have $1.29 as the total cost of a barrel of apples.

We come now to the average price of apples for the past ten years, as grown in this orchard. We have received an average of $2.60 for all the barreled stock sold, which includes firsts and seconds. For evaporator and cider stock we have received sixty-seven cents per barrel, rather above the average, possibly, because two seasons' gales of wind, as I have said, gave an abnormally large quantity of very good windfalls.

We are now ready to calculate profits and declare dividends: Subtracting $1.29, the cost of a barrel of apples, from $2.60, the amount received, we have a net profit of $1.31 per barrel for firsts and seconds. Multiplying by 79, the number of barrels per acre, we have $103.49 as the profit per acre for firsts and seconds. Subtracting 72 cents from 93 cents we have 21 cents as the difference between average cost of production and average selling price of culls. Multiplying 37.5, the number of barrels of culls per acre, by 21, we have a loss of $7.89 per acre on the culls, leaving the average net profit per acre, in this orchard for the past ten years, $95.60; add to this the $25 interest on the investment and we have $120.60 net, or 24.12 per cent as the annual ten year dividend from this orchard.

In closing I must make several general statements.

The first of these is that we have not been skimming the pan in this orchard work, and the milk that is left is equally as good as that we have taken. We shall expect this orchard, barring accidents, to do as well, or rather better, during the next twenty years than it has in the past ten.

Secondly, as good or better dividends are coming from many New York apple orchards similarly situated and similarly cared for. The figures given are a fair average for a Baldwin orchard in its fourth decade. The cost of production is, if anything, high, since the state cannot do work as cheaply as an individual. The extra cost, if such there be, has been offset, however, by the skill and efficiency with which the superintendent, in direct charge of the work, has managed every detail.

Third, the profits of this orchard are probably many times greater than those from the average plantation in New York. Indeed, I suspect that if we had the financial history of every apple tree in New York we would find that the total cost of all quite equals the receipts from all—in other words, many are losing and few are winning. This is the history of financial endeavors in all industries.

Fourth, and in conclusion, the dividend of 24.12 per cent on an investment of $500 per acre stands for the opportunity in the hands of the apple-growers of New York. It remains for the individual to accept and make the most of the opportunity or to neglect it. Ali Hafed, a prince in India, sold his estate to search for diamonds in foreign lands. His successor, watering his camels in the garden, saw the gleam of gems and found acres of diamonds, and Ali Hafed's estate became the Golconda mines. Had the Indian prince had eyes to see he would have had boundless wealth at home instead of poverty, starvation and death in a foreign land. And so there are bonanzas in growing apples right at hand for those who have eyes to see and hands and brain to work.

QUESTION BOX.

IN CHARGE OF A. K. GARDNER.

MR. GARDNER: We have listened to these outside speakers on various topics, we have had a chance to question them and talk over many of the questions here, but there are many others that we have not taken up and that we can take up now among ourselves. Now we are all at home. At the Grange hall everybody is able to get up and talk and give his views, and we should do the same thing here.

Question: I would like to call on you to answer question 1.

MR. GARDNER: I think that is not in the agreement, as I understand it, to call on the chair.

No. 1. Who has found it profitable to pack the best apples in boxes? I will ask Mr. Johnson to give his views.

MR. JOHNSON: Well, I will say that I never raised any apples to pack in boxes. I think by all means it would be much more profitable to pack the best quality apples in boxes. To give an illustration, I was out in the country a few days ago, looking over some orchards, and I came across some apples that were very good in quality and looks, and I offered the man $2.75 a barrel on the trees, to go out and pick them, and I would have my apple shooks sent up and pack them in boxes myself. Well, I took a sample of those apples down to the city, showed them to some of the dealers, and I was offered $3 a box for every box I could produce. Now there are practically three boxes to a barrel. That would be at the rate of roughly $9 for what you would pay $2.75. Of course you would have to take out the expense of the box and your own labor. But I doubt if those same apples were put in barrels you could get as much money for them. And I think just as soon as we put some of our fancy quality apples in boxes we will get more money.

MR. ———: I had thirty-one barrels of apples this season, something entirely new to me. Being out of a job I wanted something to do. I got thirty-one barrels. I packed eighteen standard boxes for which I got $3.25 apiece. My boxes cost me 18 cents in shook, and I packed the apples and wrapped each one in paper, and sent them out the best I knew how. They were glad to buy them at $3.25 a box. I had some trouble in selling my No. 2's.

Question: What variety was that?

Answer: Baldwins and Northern Spies.

MR. CONANT: I think it is nearly always understood that very few apples in Maine have ever been put in boxes, and I thought perhaps this question would be an important one at this time. It is my judgment that with some of our best grades of fruit, that is, the best table varieties and those in fancy grade, it is profitable to pack and market a certain per cent of them, at least, in boxes. We, as a coöperative body, in Oxford county, have had a little experience in boxing some fruit, and we find it profitable to box some of the fancy grades of certain varieties and market them that way.

Question: What were the principal varieties?

MR. CONANT: We boxed fancy Baldwins, Northern Spy, McIntosh Red, and some Fameuse.

Question: What per cent?

MR. CONANT: A very small percentage. It would be impossible to tell the percentage of those taken from the tree. I spoke only of the fancy grade. I think it will not be profitable in Maine for years to come to pack anything but the fancy grade in boxes. I think the lower grades should go in barrels.

No. 10. Have any of our members tried parcel post to market their apples and with what results?

DR. TWITCHELL: I marketed nearly a hundred bushels of plums last year very largely by parcel post, shipping them in carriers—peach baskets—four and six quarts, principally in six quart baskets.

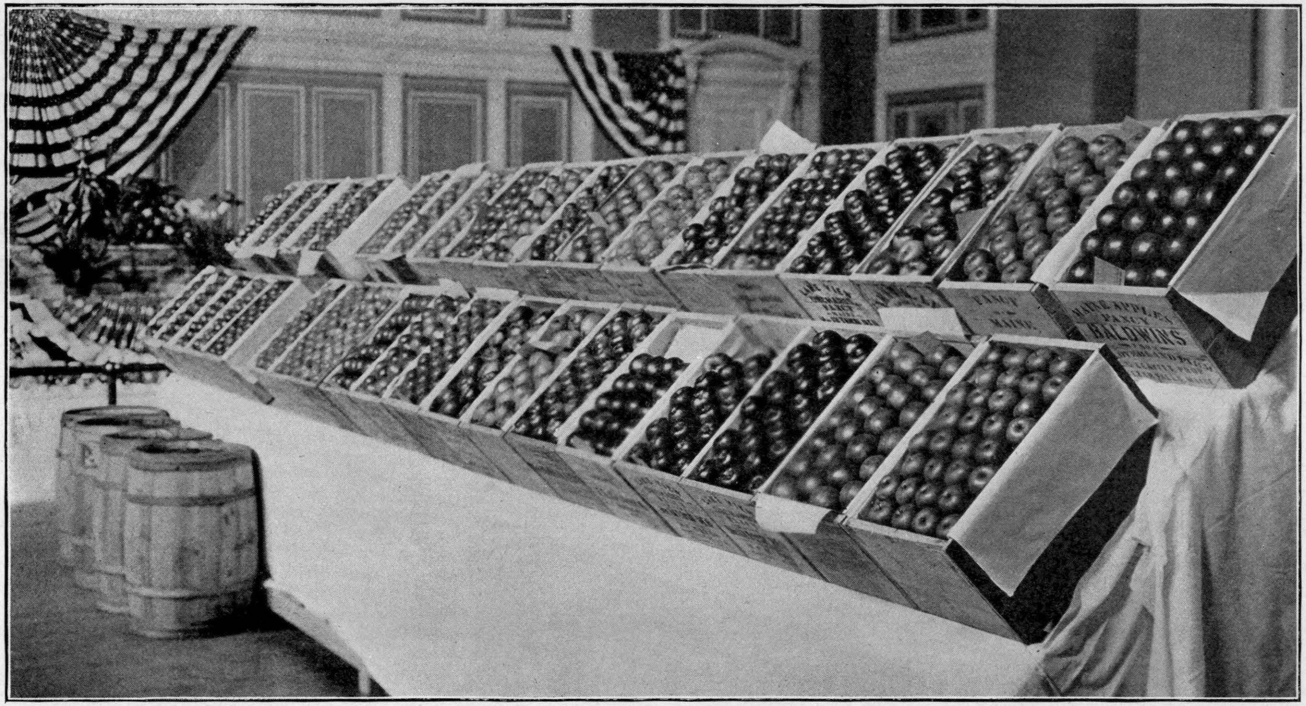
I would like to ask Mr. Conant, going back to the other quesion—out of 100 barrels, how many boxes one would get?

MR. CONANT: Well, I think it would be impossible for me to give you any figures on that, because we never kept any account. We were not trying to get data on that question, simply taking out the better grades and packing the others, practically at the same time, so it would be impossible for me to give you the figures on that. All is, I know this, we made money with certain varieties by selling them that way. For instance, a box of Northern Spies, running from 72 to 81 count, would bring $2.75, while a good barrel of No. 1 Northern spies would bring perhaps $3. You have got to get but a small per cent of fancies to increase the income per barrel.

DR. TWITCHELL: I was thinking, out of a hundred barrels, how you would pan out—your number 2's?

MR. CONANT: It would depend wholly on the per cent of fancies you grew, the quality of the lower grades, whether you would be robbing your lower grades to get this fruit, but if you are really growing fancy fruit, you can sell some fancy fruit and yet pack No. 1's and good No. 2's, without robbing those other grades. For instance, one of our growers last year graded fancy Baldwins from his orchard, quite a large per cent —I am not able to give you just the figures, but a large per cent were graded from this man's orchard, and yet when we came to figure up his lower grades, 1's and 2's, he had then a higher per cent of No. 1's than nearly any other member in our association. I remember that very distinctly, and it is quite an interesting fact, that he packed a lot of fancies and yet his No 1 grade ran higher than any other member of the association in that particular variety.

PROF. HEDRICK: Some six or eight years ago, in our state, men at Cornell University, who were talking marketing, and the extension workers as well, were all advocating the box package for apples, especially for fancy apples, and for some two or three years a goodly number of the growers did attempt to put apples in boxes and sell them. So far as I know nearly all of them have stopped. Now I don't want to discourage, in the least, the box apple proposition in this state. Your orchards will average smaller, as I said in my talk. Your fruit is better colored. It has more fancy than ours. And yet, I am inclined to think that I would like to discourage any effort that looks toward getting $3 a box for apples. It is all right for the individual, but if we are going to attempt to get a fancy price for any considerable quantity of our apples and sell them only to people who live on Wall street and do that sort of thing, five cents at the fruit stand, we are going to discourage tremendously the use of apples by the common people. As I look at it, the grower ought to be content with a big crop and fair prices. Let the consumer have them at a fair price; he ought to exert his efforts in every way possible to gradually increase the consumption of apples everywhere—among the



Portion of the Box Exhibit at Annual Meeting, Maine State Pomological Society, Portland, Nov. 2-4, 1915.

common people, the working people, sell to them at a reasonable price. You simply cannot do it if you put them in boxes. There are advantages in the box, of course—it is handier. You can buy a box and take the fruit home. The bushel basket with a cover is a better package. You can sell the fruit more nearly at a price that common people, average people—not those who live in luxury—can afford to pay. And so at our Station, and Cornell has joined in the effort, too, in New York, we are now trying to tell our apple growers to cut the expense every way possible and yet grow a big crop of apples, give a fair, honest pack, accept a price that will remunerate them and give them a fair profit, distribute them as generally as possible, and get everybody in the United States to eating apples at a price they can afford. Now you can't do that with box apples, although, of course, you will understand there is a certain demand for box apples, and if you have the stuff to put in boxes it is up to you to get the high prices that have been mentioned here.

Mr. ————: It seems to me we should have some smaller package in addition to the barrel. For instance, take our McIntosh Red and put it into a barrel; you are going to bruise a good many of them. It is not a barrel apple to my mind at all.

Prof. Hedrick: Our growers are shipping a great many apples in the bushel basket and it is a good package, putting a peg in the center of the basket so the cover rests not only on the sides but on this peg in the center. They ship a great many apples from the Hudson and some from Western New York, and a great many people in Michigan. Tremendous quantities of peaches are shipped in bushel baskets. It will answer all the purposes of the box, so far as a small package is concerned.

Question: What about the peach basket?

Prof. Hedrick: I should think they might well be packed in peach baskets,—the McIntosh, fancy products. It would take less trouble to pack a peach basket than a box. It is not an easy job, as any one knows who has tried it several times, to pack a box of apples and do it decently. It is an expensive operation and it takes too much time, and only the fancy trade can take those apples. Please don't think I am trying to discourage the selling of apples in boxes, if you have the box stuff and want to put it up that way, but I should be sorry to see all the apples boxed, because it would mean that none but wealthy people could buy and eat apples, and that is wrong.

MR. CONANT: I don't want Mr. Hedrick to go back with the idea that we are all planning to sell our fruit in boxes. Such is not the case. Our aim is to grow good barrel apples and sell them at a reasonable price, and also to increase consumption. But speaking of certain table varieties, I question whether we could ever ship to the markets out of New England in such a package. It has to go out, from the fruit growing districts in car load lots to get the minimum rate, and I question about the basket package ever being a practical package to pile into a car.

PROF. HEDRICK: They do peaches right along. You can handle them splendidly.

MR. ————: I am glad to know that, but it did not appear to me it would be a proper package for us to try to ship apples in by freight, quite a distance.

MR. GARDNER: I would like to ask Prof. Hedrick—is that a heavier basket than the ordinary?

PROF. HEDRICK: No, it is the common bushel basket with a board top and a round peg that sets down in the middle of the basket that the top rests on, as well as on the side, so that in stacking them the upper layers of baskets do not rest on the fruit in the lower layers. There is no crushing the apples at all.

Question: Can you give us the price of those baskets?

PROF. HEDRICK: I can't give you the price offhand, I think it runs from twelve to fifteen cents a package.

Question: Not as much as the boxes?

PROF. HEDRICK: No, not as much as the boxes—not with the expense of packing.

MR. KEYSER: I think when we talk about box fruit we are apt to overlook the fact that apples are of many varieties and numerous grades, and when they get into the market they reach the various channels, as a rule, where they belong. I believe the fancy table apples should be boxed. I don't raise the fancy stuff. Mine are largely Baldwin and Greening. But a short time back I was talking with Mr. Hallowell, of Philadelphia. Mr. Hallowell has the fruit business on the Pennsylvania railroad division between New York, Philadelphia and Harrisburg, which we all recognize as very considerable. Mr. Hallowell told me fancy apples like McIntosh should be put up in some shape—like two dozen in a package, that can be sold at their fruit stands—that a man can carry home with him at night to his suburban home. He says we have no idea what the demand is for a package of that kind. You go to the large cities today—Dr. Twitchell will bear me out—watch them leave the New York Central in the fall of the year, and you will see hundreds of them trooping through the station, going to their suburban homes, carrying one or two baskets of grapes; and that same rule will apply to such fancy varieties as McIntosh Red and some special varieties. But at the same time we don't want to get the idea of boxing everything or anything. That is all wrong. It just applies to a few special fancy table grades. But he says there is a demand for that kind of a package, and a big demand, something that can be carried from these fancy fruit stands without any expense.

PROF. HEDRICK: I can quite agree with all that. I only want to say a word in regard to the main part of the apple crop.

MR. KEYSER: I think so, too. For our commercial apple the barrel is undoubtedly the package.

Question: Don't you think one of the reasons why the average consumer can't buy your fancy fruit is on account of the high price the retailer charges? I was in a store the other day. They had some Wealthy apples, raised and packed in Massachusetts, and they had a tag on them, fifty cents a dozen. Now look at the count on the end of the box. It was 138. That is practically twelve dozen. This would be around $6 a box. I went up to the fruit man and asked him what he had to pay for the box to the grower and he said $3.50. Now you see the retailer is making $2.50 a box profit. If he could only cut the price a little, I think that fancy stuff would get in more hands and increase the consumption.

PROF. HEDRICK: People are going to buy oranges and grapefruit when they have to pay that price for apples.

PROF. BROWN: A year ago the students at the college packed some hundred boxes of apples. Not having fancy and No. 1, we pack No. 2. Some culls got in, by the way. Not knowing what to do with them, I sent them to Boston, and I can say that the price I got was equivalent, if not a little better, than the same class of fruit in barrels. The box cost me practically the same as the barrel. The students' labor probably would have thrown the balance the other way. But the point is this: That people in the cities who buy No. 2 in boxes will buy culls and anything in boxes just as quick as they will in barrels, and I think a great many will buy them quicker. The question is also raised about the percentage of fancies. We barreled some 200 barrels of Mildings from the tree, as they were picked. The orchard was fair, nothing extra, and as I remember the figures, fancy, 3%, No. 1, 17%, No. 2, 35%, culls balance 45%. I think it is typical of most of the orchards.

MR. GARDNER: I was in an orchard this year, and in a McIntosh grade I will guarantee that 80% of them could have been boxed as fancy this year.

MR. KEYSER: That is where you need to box.

MR. GARDNER: It seems to me, however, in addition to that, as long as we are doing an export trade, that we have got to consider the barrel pretty seriously, because it doesn't appear to me that the box would ever stand up under it.

MR. YEATON: I went into an orchard which packed out 97 1's and fancies with three that were culls—those that dropped.

MR. ————: I would like to hear No. 5 discussed. I should like to hear from Prof. Hedrick on this question.

No. 5. On acount of the cultivation of orchards producing heavy foliage should not the trees have thorough pruning to let in the sun?

PROF. HEDRICK: One principle of pruning is to stimulate growth, invigorate the tree, renew its youth. I would be afraid if you undertook to prune a tree severely you would get an even greater growth the next year. On the other hand, without any question, it is necessary and altogether desirable to thin out the top of the trees, occasionally, so that the sun can get in. But to prune heavily, to cut out a lot of the foliage, will give you more foliage and greener fruit the next year than you had before. That is a remedy that will have to be applied pretty carefully, and more often the remedy will fail than work. The pruning knife is often like a sword in the hands of a child. It must be used skilfully and carefully, if you are going to get good results.

MR. GARDNER: You consider that also applies to pruning or thinning, taking out small branches?

PROF. HEDRICK: Well, that is pruning, and the more you cut out, the more you stimulate the growth, the more you are going to get the next year. Unquestionably, some pruning should be done to open the tops of trees, but a severe pruning, a heavy pruning, is going to augment the trouble, rather than lessen it.

MR. GARDNER: May I ask whether in New York State you prune in the early part of the tree's growth to what we term an open top?

PROF. HEDRICK: No, very few New York growers prune to secure an open top to the apple tree. They leave the center in. They like a two or three story tree. It gives much better bearing surface than the open center. Of course many factors enter into pruning. Suppose your orchard is in sandy, gravelly land. The normal growth is small. Under such conditions you can prune heavily. But take the reverse, the heavy land, the rich land, the trees are making a large growth. Too often the owner thinks, "I must cut down, curtail the growth of those trees. I am going to do it by pruning." He simply augments the trouble when he prunes heavily in such soil. Then there is all the difference in the world in varieties. Some sorts, like Baldwin, Greening, Northern Spy, large growers at best, ought not to be pruned nearly as heavily as Rome Beauty, Wealthy, Jonathan, or even McIntosh, although the McIntosh is a fairly thrifty grower. It is a general rule, the poorer the soil the more you can prune, and it is also a general rule, the weaker the growth of the tree, normally, the variety, the more you can prune. All those things have to be taken into consideration.

Question: Do you think that is one reason why you do not get better colored fruit there as you do in some other sections?

Answer: That is one reason, and then the fact that we like dollars and cents, and that apple buyers, as a rule, will pay no more for highly colored fruit than for that that is less highly colored, and size and quantity in fruits are antagonistic to color in fruit, and so our growers aim to get the maximum size and the maximum quantity rather than the highest color. They make more money by so doing, at least temporarily.

MR. GARDNER: We have been troubled this year, particularly, with blotch on fruit, laying it primarily to our wet season, but we get a good deal any season where the trees are very thick.

PROF. HEDRICK: That is another factor that has to be taken into consideration in pruning.

No. 4. Are we to expect more money in the future for apples, as a result of the grading and packing law?

MR. KEYSER: That is a very hard question to answer. I should say, in a general way, yes, while, of course, no law makes a man honest. You cannot force him to be honest. The gentleman here yesterday, from Liverpool, told you that the grade of fruit that was received last year was much better in grading and packing than it had been for years, and was in better demand, and would receive a slight advance in price. I can only answer the question in a general way, yes, because I think anything that has a tendency to raise the standard of anything in the market and make it a standard will cause a better price.

MR. ————: It seems to me that question was pretty well answered in the address given by Mr. Bassett this morning. I think there is not much chance for argument or discussion on it. He said that first we must have a standard. And it seems to me that if we pack our grades, as specified in this law, we certainly will have a standard. When we have a standard we have something definite, something that can be relied upon.

Question: Who is going to determine what that standard is, when nine-tenths of our apples are sold by the growers to be packed by the buyers?

MR. KEYSER: It is the duty of the Commissioner of Agriculture to enforce the law. The law is about as broad as it can be made and be fair to the grower and fair to the consumer at the same time. What we were aiming at, largely, was the strictly dishonest pack. That is what we were after. And that there was such a pack, no one denied—couldn't deny. Of course the standard must vary in different sections, and vary from year to year. The standard this year is not as high as it was last year, even if they were packed according to the law. Nothing to prevent it, unless one set of packers was doing all the packing. It is a big thing if we can get at it now in a general way, but the duty, of course, lays with the inspectors.

MR. GARDNER: It seems to me that the ultimate standard rests entirely with the court.

MR. KEYSER: Well, finally, of course.

MR. GARDNER: The temporary standard rests with the Commissioner.

Professor Hedrick is asked to answer question No. 2.—What are the best tools for orchard cultivation where trees are low-headed?

PROF. HEDRICK: Oh, I can't answer that question, Mr. Chairman. I have not paid much attention to tools. There are tools, and tools, and tools, and so much depends upon the soil and locality. There are as many tools as patent cereals. I know we have no trouble in getting low down tools and those that spread out, for our work in New York, and you must be able to get them here, but I can't give you the names of them. Some of the growers will be able to name them for you.

Question: Do you use the extension tools?

PROF. HEDRICK: We use the extension tools, and we have no tools with handles. We have a special harness, and try in every way possible to have a tool that can do as little injury to the tree as possible. At every exhibition of our Horticultural Society or State Fair you see a considerable number of these tools, most of them manufactured in the middle west, it seems to me. But there are plenty of them, good tools. Every orchard, I should say, or every type of soil, would need a tool particularly adapted to that type of soil. We have no stones in our state, whatsoever. As I came through New England I saw that you do have a few stones. I expect that the tools we use would not be quite the tools you would want on your stonier land.

MR. YEATON: In the cultivation of the orchard, in using the disc harrow we used a piece of chain, about six feet long, between the spreader and where the horses were attached, and we found that we could drive them in a zigzag way under those trees and we could get right close to the tree without doing any injury whatever—go back and forth, to the right of the first tree and to the left of the second, and then reverse that action coming back. We got right close to the tree without going to the expense of any special tool for the orchard work. We simply use the tools that we use about our common farming operations. That has been, with us, the most practical of anything, using the spring tooth harrow and the disc both, in that method, with the team. The question would naturally arise in the mind of every man here, "Isn't that hard on the team, having them hooked so far away?" We only use that going out and back; then we shorten that chain right up and put the team back where it naturally would be hitched. That has given us remarkably good results and has lessened the cost of the orchard operations by saving one extra tool.

No. 26. To what extent should we force our young trees until they come into bearing?

MR. BRAGDON: I have done all that I could do to force my trees—that is, I have, moderately. The first year I used two ounces nitrate of soda, with wood ashes; the second year four ounces, and the third year following that I used about four pounds of 4-7-7—something like that. So you see my trees got quite a lot of fertilization. And I have pruned, whenever I have been near a tree. I have done most of it in the winter. My opinion is that you cannot push a tree much too hard to get it into bearing early. Those who have seen my trees—they are larger I think than any in the neighborhood, and most people are surprised to think they ever bore any fruit considering they grow so fast. And there are a lot of my trees I got two bushels of apples from this last fall—perhaps a hundred of them. The block that was in the Gregory competition that took fourth, we got almost five bushels of apples from; trees planted in 1910, one-year-old whips. I would like to hear the experience of some of the others in regard to that.

MR. GARDNER: That was with practically the mulch system all the way through, was it not?

MR. BRAGDON: Oh, yes. I might state that the orchard that scored highest—I have one block in my name, and that one that scored highest was in my wife's name. Of course I acted under her instructions,—they have been mulched very heavily, whereas mine were grown pretty much clean cultivation. The block grown under clean cultivation score eighth in that competition. Those entered in my wife's name were mulched heavily, in heavy sod—scored fourth. Those trees were looking very fine. They have grown very regularly. In fact they are putting on more growth now than any trees I have. This year they look much better than last year, in comparison with other trees I have. I am trying another block planted this spring under the mulch system, and one under clean cultivation, to see if I can satisfy myself that the mulch is the best in that locality. Those trees that I put into clean cultivation this year were put into a piece of land that has been planted to potatoes two years running, and it is in excellent condition. The other block was put into an old field that has had nothing done to it for perhaps five years, only just to cut the grass, so that block is not getting the fair show that the other one is getting. Yet they have put on a good growth already. They were mulched very heavily with perhaps sixty to seventy pounds.

Dr. Twitchell: What do you mean by forcing trees?

Mr. Gardner: I presume that would refer, perhaps, to an average growth of over eighteen inches.

Dr. Twitchell: I have some trees that with two pounds of fertilizer, in the spring, made a growth of two and one-half feet. They haven't been forced, surely. They had a space seven feet around them, hoed, as I hoe my corn—weeds kept down. I have a row of trees in front of my bungalow that has made pretty good growth that haven't had any fertilizer since the second year, except what they have taken from the garden—they are alongside the garden—until 1913 when I broke the land on the other side and have planted it two seasons. Mr. Yeaton and Prof. Hitchings saw the trees this fall, circumference about sixteen or seventeen inches. They were set in 1909. Speaking about forcing trees, I don't know whether I have forced those or not. I haven't thought of it. I commenced with those trees set in 1910, putting two quarts of bone meal into the cavity before I set them, worked into the soil. Then I commenced on half a pint of fertilizer, $4\frac{1}{2}$-9-$7\frac{1}{2}$, and increased that every year, until this year they had two and a half pounds. The trees are healthy. This year they have made larger growth than before. Many of them made a growth of two feet to two and a half feet. But still I feel that there has not been any forcing process. There has been no thought of that on my part.

Mr. Gardner: Of course the main thought in young trees is not, perhaps, so much the amount of growth they put on as the amount of growth that ripens thoroughly before winter sets in. Of course if we don't have our tops well matured and well ripened they are going to suffer more or less from winter-killing, at least, checking the tree. Some of the Gregory orchards put on a large growth, and late, in cultivated gardens, where the cultivation was kept up during the summer, yet even on very high ground where they would be subject to very little winter-killing, they were retarded for the second season and they never picked up sufficiently to get back to the rest of the good orchards, though they were given very good care.

DR. TWITCHELL: I have perhaps two or three hundred young trees growing. I never see any winter-killing. This row of trees in front of the house—one of them Prof. Hitchings and Mr. Yeaton measured and found the circumference 16½ inches about 8 inches from the ground—tree about 15 feet high, spread 20 feet, set in 1901. It may be the largest. Some others have not spread as much as that. Those trees haven't had any special fertilizer since the second year. Of course they are alongside my garden.

MR. BRAGDON: Those trees of mine that grow the most vigorously winter the best, always. You know the location of my farm is high, so that what growth I get, I get fairly early in the season. Therefore the wood would naturally ripen very well. But it was the trees that grew the best that wintered the best with me, and those that grew the poorest, it seemed, were the ones that died. Perhaps something was wrong with the tree in the start before it was planted.

MR. YEATON: It has been my policy to grow the tree as rapidly as was consistent with ripening the wood, until it came to a bearing age, because we have got to get a large bearing surface, if we are to get a profitable crop of apples from any tree, and with a fair amount of fertilization and cultivation we can get a good growth and still ripen them, and I have felt that it was a business proposition for us to grow them quite rapidly, during the first five years.

No. 9. Will not the high price of potash teach the farmers that they have been using too much potash?

MR. GARDNER: It seems to me that is a question that the potato growers might speak on better at this time than any one else.

DR. TWITCHELL: Mr. Emery makes the statement in a recent issue of the Farmer that in many cases where potato growers used their 4-6-10—had a little left over from 1914—used their 4-6-10 and alongside used their 4-10-4 or 4-8-4, that the yield was about double on the 4-6-10, and I think he closes with something like this statement—I don't want to be quoted as giving his words exactly—this proves that we need a larger percentage of potash than we are getting at the present time, and with the prospect that we are going to get about one, next year, we don't know what we are going to face, if that is so. I don't know what the experience of others will be, but I have a strong feeling—haven't proven it—that with my trees I want a good per cent of potash in the fertilizer.

Question. If potatoes respond to potash, does it hold that trees will?

DR. TWITCHELL: No. I say I haven't proved it. I can't state that, as a fact, but I have that feeling with trees I have treated in different ways I have got better results—that does not prove, because I do not understand all the conditions which surround the individual trees.

PROF. HEDRICK: Mr. Chairman, I may state we are just closing an experiment on fertilizers in the apple orchard. This is the twentieth year we have applied fertilizer to an apple orchard in Geneva, New York. The check trees are yielding this twentieth year, and have yielded every one of the nineteen previous years just as much fruit as the trees we fertilize, except in the case of nitrogen applied as stable manure, and we don't know in that case whether it is the nitrogen or the humus. I wouldn't say that from what has happened there that is what would happen in Maine. But those are the conditions. An analysis of our soil shows us that the top foot of soil has potash enough for an apple tree bearing twenty bushels to the tree, to last 964 years, and phosphorus to last 450 years, enough nitrogen to last something over 100 years. Ours is a rather heavy clay soil. We published the results from this orchard five years ago, when we had been applying fertilizers fifteen years, and fruit growers in New York, very generally, especially in case of clay soils, are not now fertilizing. But we think the problem is to make available the potash and the acid phosphate and the nitrogen that are in the soil, rather than to buy fertilizer, though we do have an increase by the use of stable manure. But, as I have said, I do not know whether it is the nitrogen or the humus. We are repeating this experiment on fourteen orchards in different parts of the state on different soils, but you cannot tell anything about experiments until they have run four or five years, and ten years is better. Some of these fourteen orchards that

I speak of, especially those on the sandy soil, do show some results from phosphorus, as well as from nitrogen, but up to date we have not found any place in the state of New York where a tree responds to the application of potash. Now we may find that later, but we have not found it as yet. I asked Dr. Twitchell whether it would hold that because potatoes respond to potash, apple trees will. I don't believe it will. For this reason, the apple begins to grow early in the season and continues to grow until frosts come—heavy frosts at that. The potato does not have half the growing season, neither do any other farm crops. The apple has five or six years, before it begins bearing, to make growth and send its roots down. The apple roots have a feeding surface of six, eight, ten or fifteen times as much as a potato. They go way down and spread way out. You have no idea, unless you have dug up the roots, how far they spread out, sometimes thirty or forty feet, often fifteen or twenty feet. The product from apple trees is nearly all water, from eighty to ninety per cent water. The leaves go back on the soil. The apple tree is a heavy drinker. The leaves transpire more water in proportion than do the leaves of the potato. And for all these reasons I am inclined to think that the apple, and other fruit trees as well, need far less fertilizers, providing you are cultivating the soil and using every means available to set free the food in the soil than other farm crops, generally. You only need to look at your stony mountain sides and the tremendous trees that grow there to know that a tree can get along with relatively little plant food. Now don't misunderstand. Don't say that I said never to apply fertilizers to an apple orchard or any other tree. I haven't said that. On the contrary, I know, occasionally, trees do respond to the application of fertilizers. And I am sure they must have nitrogen. But I am inclined to think, in our state any way, and I am speaking now for New York, more money is wasted in buying fertilizers for apple orchards than is well spent.

Mr. Gardner: Would you say then that the principal factors were humus and moisture?

Prof. Hedrick: Humus and moisture are more important factors in growing apples than plant food. The plant food in the average soil is there, if you only set it free. The fertilizer men don't like this kind of talk, and they everlastingly go at me, but we have the facts for New York, and you have the same facts over here at Durham, N H., in large measure, and it will pay you to leave a few check trees in your apple orchard, if you are using fertilizers, and see what the difference is between the check trees and those you fertilize. Another point must be made. We have found that trees in sod will respond to fertilizer, whereas those that are cultivated will not. I have never seen it fail that an application of nitrate of soda to trees in sod would not produce results, and acid phosphate often produces results when they are in sod.

MR. MORSE: The Professor perhaps does not realize the difference between the cost of cultivating a soil like his and some of our best orchard soils up here. He says that we have no idea of the way the roots spread out, unless we have tried it. He has no idea how an apple tree would look down here, unless it is thoroughly cultivated or fertilized. I know just how they look, and after they have been fertilized, and I think that on a good share of our best orchard land it is cheaper for us to buy fertilizer and grow them that way than it is to give them thorough cultivation.

PROF. HEDRICK: Do you know whether it is potash, nitrogen or acid phosphate that does the business?

MR. MORSE: I don't.

PROF. HEDRICK: Are you sure it is not the nitrogen they want more than anything else. Don't you think stable manure with very little acid phosphate would give the results—if you should mulch them with stable manure, or plow under clover or vetch, wouldn't you get the same results.

MR. MORSE: If you should get a soil good enough for clover, it will bear a good tree, but you don't realize that a good deal of our best orchard land won't bear clover. Your conditions are so different from ours that we must take your advice with a good deal of care or we should get mixed up terribly.

PROF. HEDRICK: I realize that is true, and I realize that I ought not, coming here, to say much about fertilizer. But the question was on potash. I got into this discussion to bring out the point that I think it is nitrogen that your trees need, if you can get it—stable manure—vetch and clover plowed in, if you can get it. I may be wrong. I have had no experience in Maine. I may be altogether wrong, although I am banking a little on these experiments that have been carried on over at Durham, N. H., on a soil not very widely different from yours and where the results were quite similar to those that we had in New York.

MR. MORSE: Don't misunderstand me. I said that on a good deal of our best orchard land it was cheaper to buy fertilizer than to cultivate the soil. I don't like to quote my own work, but of course I know more about that. We own an old farm, the trees set out on a hillside, and by using two or three pounds of fertilizer, costing four or five cents to a tree, on a tree that is two or three years old, we can get good growth. All we need to do is to spade around it a little.

PROF. HEDRICK: What would that fertilizer be, potash or nitrate of soda?

MR. MORSE: Well, I have used my own formulas and when I first commenced I used heavily the potash, but I have swung it round and on the growing trees I use about 4-7-4, I think, when I can get it. This question that came up here, it seems to me we have got to wait and see if we can get potash. If we can't we must get along without it.

PROF. HEDRICK: When you can't get it, try the nitrate of soda.

MR. MORSE: I have seen that tried and, as you say, it will always show increase. I don't know so much about it in thorough cultivation. I have been using chemical fertilizers for more than fifteen years, and, as I told them here yesterday, it seems now I have got to the point where I must have something else. The trees have gone back in the last three or four years. And now I think we must have humus of some kind. The question is, how shall we get it? The best orchard land we have is on a high hill, tremendously expensive to haul dressing there, if you can buy it—almost impossible to find it, any way. So it seems to be a question. I wish you could give me a tip on how to manage the trees and make them come back to the original bearing. We had wonderful success the first eight or ten years with our fertilizer. We thought we knew almost all about it—all we had to do was to set out an orchard, use a little chemical fertilizer, spray them a little, and we could raise apples and get rich right off.

PROF. HEDRICK: Grow rye or some crop of that kind to get more humus.

Mr. Morse: We have tried vetch, clover and rye.

Prof. Hedrick: The humus I am sure the tree has to have.

Mr. Morse: That is the point and I wish you could tell me how to get it.

Mr. Keyser: Mr. Chairman, Mr. Conant as a member of the Station Council will find on his first visit to the state farm a block of twenty trees that have received the cultivation, the cover crop, the same as the adjoining blocks, minus the fertilization; for three years they have had no fertilization whatever. And the crop yield from those twenty trees has averaged up to the balance of the orchard. That confirms Prof. Hedrick's experiment that they are carrying on at Geneva, only in a much lesser way. This is the third year. At our meeting at Lewiston, two years ago, you will remember Mr. Woodworth stated that in the Annapolis Valley they had been doing fall plowing for twenty-five to thirty years, late in the fall, just before the ground froze, and that they had never had any bad effects from it. Consequently, two years ago, we took a block of trees at the state farm, and they are receiving now the second plowing; they have been through their first winter.

Prof. Hedrick: Will you let me say in that connection that every acre of our two or three hundred acres in New York is now plowed in the fall and we wouldn't go back to spring plowing for anything. And ours is a heavy clay soil. We find the weather in the winter—freezing and thawing—has something to do with freeing the food elements in the soil. We plow our peaches and berries. The land is in better tilth the next summer because of the fall plowing.

Question: What time do you plow?

Prof. Hedrick: We begin about the middle of October and keep at it till it is all done. Just as soon as the crops are off we begin to plow.

Dr. Twitchell: Touching the use of application of nitrate of soda: I made an application of half a pound to see what the effect would be upon a couple of trees, half a pound in sixteen quarts of water, and sprinkled it out, just outside of the drip of the trees, and I do not remember of any one coming there during the summer—that is when the leaves were about three-quarters grown—and looking over those trees but that called my attention to these trees and the size of the leaves and the deep color and glossiness. They were not treated in any way different, but just the addition of half a pound of nitrate of soda to a tree. I did that to see how small an amount would be noticeable upon the leaves.

No. 13. How shall we protect our young trees from borers and mice?

MR. YEATON: One time a fellow came along and said to a neighbor, "Come into the house and have a drink. I have just been making some spruce beer." They went into the cellar together. The whole top of the cistern was open. The fellow that went in walked along and looked in—"Don't the rats ever get into that cistern?" He says, "Yes, but we skim them out."

Question: That is all right for the borers, but tell me how to get the mice?

MR. YEATON: The most practical way, the cheapest, least expensive of anything we have tried is to take some wire screen or common window screen, make a very thin paint, lead and oil, cut the screen the size that we want, and just simply dip them in that lead and oil, and have a wire peg sticking up right over this dish to put them on and let them drip back in. That will last five years, and by that time you will want another job to put more wire on.

MR. GARDNER: One of the latest recommendations is heavy white paint, paint about eighteen inches or so.

No. 14. The San Jose scale is getting into our state. Shall we ask legislative protection?

MR. GARDNER: I do not know just exactly what that means, whether it means a spray law.

MR. YEATON: That is the idea exactly, whether the state should enact a law that will compel spraying.

PROF. HITCHINGS: Mr. Chairman, I don't believe in that sort of measure. I think some of our speakers have already intimated here at the meeting that the San Jose scale can be controlled and if there is a spot in the state where it has started it is for the Department of Agriculture to get at it and exterminate it. I hardly think that the San Jose scale will become a pest here in Maine, to any extent, and the thorough spraying that has been referred to will handle it as well as our oyster shell scale. That is doing more damage than the San Jose scale ever will, I think, in the State of Maine.

MR. GARDNER: It certainly is.

FACTORS IN MARKETING AND DISTRIBUTION OF APPLES.

J. C. ORCUTT, Secretary Committee on Agriculture of the Boston Chamber of Commerce.

(An Illustrated Lecture).

Mr. President, Ladies and Gentlemen:

I assure you that I am very glad to be here. I am not certain that I can give you such information as you would like, but will speak to you for about twenty-five minutes on the consumption and distribution of apples. Who are the users and the buyers of these apples? And then, if you would like to ask me questions, I would be glad to answer them, if I can. If I cannot, I will readily say so.

APPLES HARVESTED IN FOUR WEEKS, BUT MARKETED AND USED FIFTY-TWO WEEKS.

These apples which you people grow commercially are all harvested in about four weeks of the year—one month's time. Now at that time there are only 4-52 of the crop consumed. That is, every week of the year consumes 1-52 of that crop, and in these four weeks of the time you are harvesting this crop there are 4-52 consumed. In other words, there is picked and offered for sale twelve times as much each week as the market will ordinarily consume. Therefore, these apples must be stored, until each 52d rolls by, either in the cellar of the producer or in cold storage houses of the cities. In the country the ordinary run of consumers buy two to six or eight barrels of apples in the fall and put them down cellar. That takes care of most of their demands.

CITY CONSUMERS' WANTS.

The average consumer in the city only buys what he wants from day to day, or week to week, that is 95% of them.

Now then, just a moment, let us consider the mass of consumers that we have, because they are the people that you must take into account if you wish to market your apples in a profitable way. You know no one can sell you an article that you don't want, or in a manner which you don't want, or done up in a package which does not suit you. So, therefore, if you are selling apples, you should consider who these consumers are, and what they want.

Consumers may be divided into a very few classes, which we might call the wholesale consumers, i. e., buying in a wholesale way—and the retail consumers. Let us take first the retail or family trade. The family trade in the city, say 80 per cent of that family trade is from the working class, earning $15 a week and under. The kind of apples they want to buy are these: First, apples for cooking, for instance Baldwins or Greenings; second, apples for eating, such as McIntosh or Gravenstein. The average consumer in the city does not want to buy a barrel of any one kind, for in the first place they have not any place to store those apples, and in the second place they do not want so many of one kind. The majority of the apples sold to the family trade are sold in peck or half peck lots. The household will order a peck or half a peck of Baldwins or other apples for cooking apples, and say a dozen of McIntosh for eating. Some other member of the family does not like McIntosh, so he orders half a dozen Gravensteins. That is the way the trade has been built up, selling the consumer what he wants and when he wants it.

Now we come to the wholesale trade, which is the great buyer of your apples, that is—hotels, restaurants, boarding houses, cafeterias, institutions. What kind of apples do these consumers want to buy? The restaurant keeper wants to buy a very nice grade of apples to put in his window to attract the people, the very nicest looking apples he can buy; second, he wants to buy a pretty good apple that he can use for a baked apple, but it can have some spots or specks, because he can cut those out and when brought on the plate the consumer won't notice it. Now then, for his apples to make sauce and pies, he wants to buy the cheapest apples that he can, because he is in business to make the most money he can. So for an apple to use in apple sauce and apple pies he will take most anything he can get. If we had some fine apples cooked and apples that didn't look so well cooked in apple sauce, I think we would have a very hard time telling the difference. This shows the threefold wants of the restaurant keeper.

The baker wants, perhaps, two kinds of apples—one which would be a very nice kind of apple, which he can cut up in large slices to put in pies, and others to chop up for pies and mincemeat.

Now then, institutions of all kinds are large buyers of food in our large cities and towns (state institutions, or institutions for insane, or for aged people, or for delinquent boys, or whatever it may be). They want to get as good an apple as they can at a reasonable price. They do not want the fancy apples.

Take the fruit stand trade; there are two classes. One class wants the apples which will be the most attractive, nice colored apples. The other kind of fruit stand trade wants to secure apples in a general lot, ungraded apples, ones and twos mixed, so that they can pick out the number ones and number twos and thereby make their profit—as they do not pay any more for ones and twos, generally, than the value of the number twos, and all the ones are so much pure velvet.

Now we have another class of trade, called the huckster and hawkers' trade. They buy of wholesale and retail commission people. They travel up and down the alleys and the streets in the city districts, selling apples to the consumer. They want to buy an ungraded apple, if they can, which they can buy at a low price and then cull them out to suit themselves.

I will endeavor to show a few pictures, illustrating how these apples are distributed to this trade which I have spoken of.

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I have tried hastily to go over the ground, showing you some of the ways in which the people live and some of the methods which are used in distribution. But that does not sell your apples. To sell apples, or sell anything else, is a business which has to have some one to look after it. A man can't be a Jack-of-all-trades, a producer, and a transporter, and a seller. You are producing an apple to sell. Then you should have some one to sell it. If you are a large grower and can get into the market yourself, understand who the dealers are—you may get along in good shape. If you are a small grower, you never can get anywhere until you have enough of your growers together so that you can hire a man to sell your apples in the same way as that association did whose shipping station I showed on the screen.

I received letters from farmers all over New England, a majority of whom have not time to make visits to the city, thinking if they send a few apples to the commission men, that he ought to sell them, find a good customer, collect the money and return it to him, and take out a small charge and give him the most of it. Now that does not happen. Understand, this commission man is not going to work for your interest unless you make it an object for him to do it—unless you are around to see what is going on. His interest is to make a living and to make money for himself. He is either going to sell those apples as quickly as he can on commission, or he is going to buy them, or have some of his friends buy them and hold them. Remember, at the time you are picking your apples and offering them for sale, you are loading on the market twelve times as much as the market will absorb. Somebody is going to buy and put their money in them. A few years ago it was a great gamble about apples. As they come to be graded more and more the prices will be more or less established, considering the available supply as it has been reported by the various crop statistics. There is no reason why growers and buyers, if the apples are well graded, if they cannot secure a proper price in the fall, cannot ship those apples to cold storage centers, borrow money on them, and hold them until it is time to put them on the market. But to do that, the individual grower, unless he understands the market, pays high for his experience. Ways of living, as I have shown by these pictures, have changed. People are not so interested in their food supply as one might think. The majority is interested in having a good time, and food is simply an incident to their living. Many are not interested necessarily in the cheapness with which they can get it. It is the easiness with which they can get it. Somebody has to perform the service. And the man who is down there and understands the business can do it better than the man up here who does not undersand it.

PRODUCER TO CONSUMER.

A great deal has been said about "from producer to consumer." In the small places that is all right. In a large place, except in probably five per cent of the trade, it never will be the case, because it costs more to ship in small lots, and, as I say, the people want the service and they don't want to trade with an individual producer.

I had a letter of inquiry from one of your good farmers down here—several letters have passed in the correspondence—in which he wanted to know the name of some good retail concern which would buy 400 barrels of nice apples—he showed me testimonials. He thought if he could get in connection with these retail stores that he could sell those apples, get the commission man's profit, and he could make some money, and that was the way to do business. I wrote him that I didn't think he could do it that way and get so much money out of it. I advised him to get in touch with some good wholesale commission man. He wrote back and said he thought I was hired by those commission men, and he still wanted to get at the retail stores. I tried to explain to that man. I said, "The retail store fellow does not want to trade with you." He could not understand me. Why does not the retail store men want to trade direct with the producer? Remember this retail store fellow who owns this corner store, who leases it, is in business to make the most he can for the fifty-two weeks in the year. That is what he is studying to do. Apples are simply an incident to his business. He handles them because his trade calls for them, but there is not considered to be as much profit on apples as on other things, because, sometimes they don't grade out as he buys them, and a good many times they keep picking them over and they don't bring so much money. He has no place to store more than four or five barrels anyway; he has no money to put into those apples, and he has no time to go into the market district and find out who are the shippers and get the apples drayed across town. So he arranges with the commission man who supplies him the apples just when he wants them, the number that he wants, extends him credit at certain times, and does not require him to furnish storage for those apples, but keeps him supplied from week to week. That is why the average retailer does not want to trade with the producer because he has no time to look up the means of transportation, getting the apples down there, and the majority do not want to buy so many at a time. The restaurants sometimes buy apples and put them in storage but the great majority simply buy three days at a time.

SELLING APPLES.

Success in selling apples to these people simply means having some one to act as your sales agent who understands these various channels and the ways in which the people live and the ways the buyers operate their business. And when you do have such a man he is the one that will be able to sell those apples, either through a commission man, retail store, or whatever seems to him the best agency to operate with over a series of years. You can't be flipping back and forth from one commission man to another, because by and by nobody cares anything about your stuff. You must have somebody to rely upon to push your business. Remember this one economic fact—if you don't look out for your business, nobody else will. You can't expect somebody else to crack it up and sell it, get the best price and do it all for you. If they are doing that, it is for their pocket-book and not yours. If you want to have that benefit, you have got to have enough produce so as to pay for having that organization.

QUESTIONS.

Question: I understand that the commission men will put apples into cold storage for you. How do they handle the cold storage?

Mr. Orcutt: What do you mean—"how they handle?"

Question: Well, if I send apples to some commission man in Boston, he to put them in cold storage for me and sell them when the market was right, what would be the terms?

Mr. Orcutt: Well, I suppose different dealers have different arrangements. A great many growers simply have a commission man act as their agent. You understand that a large commission house contracts for cold storage in the fall, or two or three go in together, and of course they get concessions, I suppose, by taking a large space. Then many times they can give concessions to the grower. It depends upon whether you are selling to the commission man or whether he is acting as your agent. You can handle your apples in three or four different ways. You can send them to a commission man and tell him to sell them as quickly as he can and return the money. He offers those for sale. He may buy them himself or have some friend buy them in or he may sell to some outside buyer.

You may send them to him and say, "Put them in storage for me. I will notify you when I want them sold." He acts as your agent at a regular commission and sells them at your direction, you taking all the risk.

Question: Who handles the contract for the storage?

MR. ORCUTT: Most of the large commission houses have regular storage place contracts, because it is very obvious a cold storage company cannot afford to sell space for fifty or a hundred barrels as cheaply as he can for ten or twenty thousand barrels. The commission man acts as broker, according to your contract with him.

Question: It is hardly advisable to send to a commission man to get storage for a small lot—it would be better to consign, wouldn't it?

MR. ORCUTT: Well, I don't know. The small lot man has a hard job to sell his produce. The different farmers from this state and other states write in like this—I will quote you as an example a man who writes in to me and says, "I shipped in 65 barrels of apples to so and so, and I got returns $1.37, and I see in the New England Homestead they have been selling for $2.10. Now who has got away with all that money in between?" Well, now, let us see. I find he has shipped three kinds, two different grades—really six kinds of apples. The majority who send in apples do it in this way. They get hold of some of the trade papers and they find a list of commission men. Generally the commission men listed in those papers are good first-class commission men. They pick out one, we will say. They must have some money about the first of January, so they get those apples together, pick them out, ship them and write, "I send you 65 barrels of apples. Want to get the highest market price by return mail." The commission man gets the letter and about the same time he gets a telephone message that the apples are in the station, and some of the help in the place have them carted over, and they don't know what kinds they are. They have to send a man to open every barrel to see what kind they are. They may ask $2.50 a barrel. Somebody comes along and says, "I will give you $1.50." They say, "All right, take them." They deduct their charges for carting and add a good lot for doing this work and return the farmer $1.17, and he sees good apples quoted $2.25 and wonders who got away with the money. Now then, the farmer says to me, "Why doesn't the commission man pay attention to my apples?" You take a big house having thousands of different packages of commodities coming in every day, and fifty barrels is a very small order—they are not going to stop their business—the heads of the firm don't know they have received anything from that man at all—it is simply a process of doing business in a large way in which a small order is lost, and all the money is taken up in various charges and costs.

Question: Can you tell us anything about auction sales in New York? Is there any disposition to have such a place in Boston?

MR. ORCUTT: I have heard some talk of it. An auction is a good way to get rid of some surplus produce, but it is not the way to sell produce. You let the other fellow set your price.

Question: Hasn't that been fairly successful?

MR. ORCUTT: Yes, but some of the best sellers don't sell that way. If I was a large grower, or a member of a large association, I should not want to use the auction a great deal; might have to. I think the auction is a necessary arrangement for general business. But what I am getting at is the way to sell produce. It doesn't make any difference whether you have apples or fertilizer to sell, you must get your product before the people in good shape, and when I sell apples I don't want to come up against an auction price. I want to get my apples in as good shape as possible—find out who the consumers are. A small amount in an auction sale isn't going to amount to anything. The produce has to be inspected and the seller has to know what it is beforehand. You have 65 barrels of apples of two or three kinds. They are eaten up by charges, opening them up to see what they are, having them listed, etc. The marketing of farm products is no different than the marketing of other products. A farmer is a manufacturer, pure and simple. He has his land from which to manufacture products. He has to use the same methods as in marketing any other kind of product, adapted to the particular line of article that he is producing. We fail to realize these two things, our changed condition of living which we illustrated here, from the old way, in which certain local producing centers had a monoply of certain consuming centers because there were no transportation facilities to get them to other centers, and no connections between trade organizations and importers. Now then, when we understand that the basis of food supply of this world is in our Middle West, in Canada, in South America, in Austria-Hungary, in Siberia, in Australia and in Africa—that those are the centers where they are producing more food than the population there consumes—now in the last ten years, by the establishment of the railroad service with the refrigerator car, the heater car, the refrigerator ship, and so on, importing and exporting houses in the different centers, any food product is going—except very bulky stuff—from the producing center to the consuming center that will pay the most money for it. And the exporting and importing houses are the most highly organized and the best business men in the world because they are the oldest business firms in the world and understand how to do it better. Why can the foreign condensed milk company come in and trim the best companies we have here? Because they were selling condensed milk long before these condensers were started in this country and they understand the game. You can't beat a man at his own game only once in a while. We get butter in our New York markets from Siberia, New Zealand and South America. There is fruit now in our markets from South Africa—came two years ago for the first time, because of the reefer ships. Quantities of eggs from China—eggs broken and the yolks put in one cask and the whites in another and brought here and put in our bakeries. This is an illustration of how, more and more, these people are buying goods in a wholesale way and bringing the people here into competition with the producers in these other sections. The man who is the best salesman, who gets his product up in the best way and gets it to the consumer, is the man who gets the business, no matter where he is located. The apple producers in the western states, with a fifty cent freight rate on a box of apples, are in a better condition to market their product because they have an agency to sell those apples which knows how to sell them.

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