PUBLIC DOCUMENTS OF MAINE:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

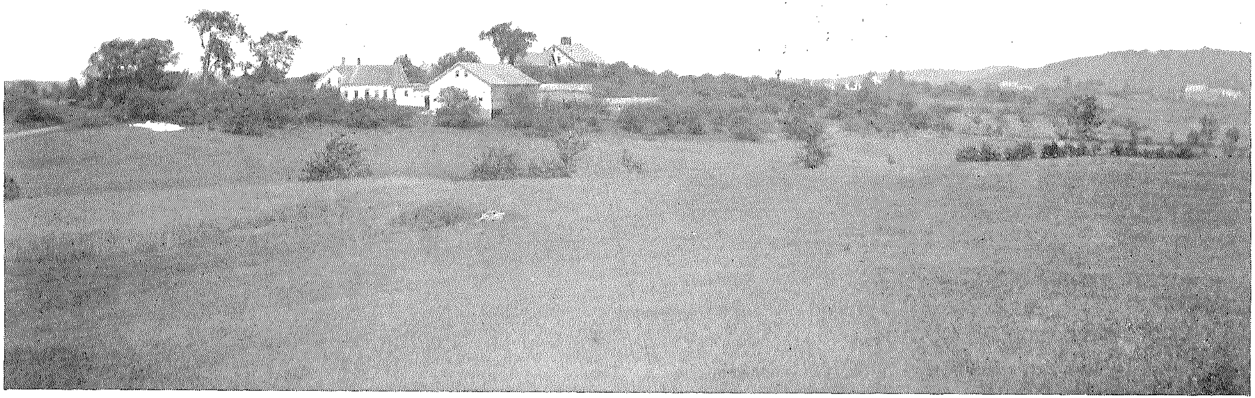
DEPARTMENTS AND INSTITUTIONS

FOR THE YEAR

1901

VOLUME I.

AUGUSTA
KENNEBEC JOURNAL PRINT
1901



FARM HOME OF JOHN F. BUKER, BOWDOIN.

AGRICULTURE OF MAINE.

FORTY-FOURTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

BOARD OF AGRICULTURE

FOR THE YEAR

1900.

PRINTED BY ORDER OF THE LEGISLATURE.

AUGUSTA
KENNEBEC JOURNAL PRINT
1901.

STATE OF MAINE.

To the Honorable, the Governor and Council of Maine:

In compliance with the laws of the State, I have the honor to present the report of the doings of the Maine Board of Agriculture for the year 1900.

B. WALKER McKEEN, *Secretary*,

AUGUSTA, January 16, 1901.

MAINE BOARD OF AGRICULTURE—1900.

OFFICERS.

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

Members Chosen by Agricultural Societies.

Term expires third Wednesday in January.

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

Members from the University of Maine.

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

Elected by the Board.

B. Walker McKeen, Secretary.

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NAHUM HINCKLEY, Vice President.
B. WALKER McKEEN, Secretary.

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Term expires third Wednesday in January.

Androscoggin County,	James L. Lowell,	Auburn,	1902
Kennebec "	A. N. Douglass,	Chelsea,	1902
Waldo "	Joseph Ellis,	Brooks,	1902
Washington "	E. F. Allen	Columbia Falls,	1902
Lincoln "	John M. Winslow,	Nobleboro,	1902
Cumberland "	John W. True,	New Gloucester,	1903
Oxford "	J. A. Roberts,	Norway,	1903
York "	S. H. Garvin,	Acton,	1903
Somerset "	Ansel Holway,	Skowhegan,	1903
Sagadahoc "	John F. Buker,	Bowdoin,	1903
Hancock "	Nahum Hinckley,	Bluehill,	1903
Aroostook "	Cyrus Chase,	Westfield,	1904
Franklin "	James Morrison,	Phillips,	1904
Knox "	E. E. Light,	Union,	1904
Penobscot "	Chas. L. Jones,	Corinna,	1904
Piscataquis "	W. H. Snow,	Milo,	1904

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Elected by the Board.

B. Walker McKeen, Secretary.

MAINE BOARD OF AGRICULTURE.

INSTITUTE PAPERS.

HISTORICAL NOTES ON THE BOARD OF AGRICULTURE AND SOME RESULTS OF ITS WORK.

By Secretary B. WALKER MCKEEN.

The Maine Board of Agriculture was organized in 1855 and the yearly records of its work are shown in the forty-four volumes that are found on the shelves of the farmers' libraries.

From its earliest foundation it has had as members and as executive officers, men who were well versed in the practical problems of agriculture. In addition to this they have been possessed of an almost boundless enthusiasm and a resolute courage, by the aid of which they have succeeded in carrying to the farmers of the State such lessons of knowledge and of faith in the soil and in the business of agriculture as have borne fruit an hundred-fold. Active and aggressive as the work of the Board has always been, it has carried along with it that candor and conservatism which have made its lessons of great value. A leader always, it has never rushed into the advocacy of any new or untried methods, and has always been prompt and strong in its denunciation of every scheme of a doubtful character. By the wisdom displayed in these matters it early won the confidence and esteem of the farmers of the State, and for this reason has been able to do more and better work than it otherwise could have done.

The first efforts among the people of the State in securing and disseminating agricultural information found shape in the formation of societies and the holding of cattle shows, which were widened in their scope when agricultural products and manufactures were added to the animal exhibits, and the name cattle shows gave place to fairs, with the broader meaning that the term implies.

The necessity for the associating together of the county societies, so that the information accumulated by them all might be published and distributed to the farmers of the State for their benefit, was apparent and had everything to commend it.

This was the cause for the passage of the law by the legislature, establishing the Board of Agriculture. At first its membership consisted of one person from each society that represented the whole or a division of a county. This gave about twenty-six members to the Board from the time of its origin until 1860, when the law was changed, and from then until 1870 its membership consisted of only one person from each county. In those counties where there were more than one regularly organized society the members were chosen from each society in turn. In 1870 an act was passed by the legislature empowering the governor of the State to appoint five members at large, and also giving the right of representation to the State Agricultural Society. In 1873 the State Pomological Society was given membership, and similar rights were given to the Maine Poultry Association in 1875, and to the Maine Dairymen's Association and the State Jersey Cattle Association in 1878.

From 1856 to 1880, meetings of three days each were held twice a year, one in January and the other in August. After the establishment of the Agricultural College the law required that the winter session be held at some point near enough so that the students of that institution could attend and have the benefits of papers and discussions of the Board. When it was desired to hold the session at some distant place, free transportation and entertainment were furnished the students.

In 1880 an act was passed reducing the membership of the Board to one representative from each county and two from the State College and providing funds for the holding of farmers' institutes. The summer meetings were discontinued and the energies of the Board were devoted to the holding of institutes in every county in the State in much the same way as is now done. At first the work, of necessity, was slow and heavy. The term *Institute* was a new one to the people, in its application to agriculture, and in many places the audiences were sparse, and the work discouraging to those engaged in it. Institute speakers were untrained and did not know how to reach and hold their listeners. Twenty years of training in the grange halls since then, has changed the audiences that are met in every section of the State and the lecturers have learned how to meet them and do better work. Where, at first, places of meeting were not always easily procured, now the doors of every grange hall in the State are open and the people are anxious to welcome the institute and its work.

In the annual reports of this Board are written the history of the agriculture of the State for nearly half a century. As we turn the pages of the earlier volumes and read the discussions at the winter meetings we are brought back to the status of agricultural practices and information that prevailed in the later fifties. The wastes, saving, and application of cattle manures were subjects that received more attention than any others during the earlier half of the lifetime of the Board. When we remember that in those days there was hardly a manure shed or cellar in the average town, we can appreciate how attractive these subjects were: "The Washing of Manure Piles by Water from the Eaves;" "Wastes of Liquid Manures through the Cracks in Barn Floors;" "The Use of Muck as an Absorbent and Preventive of Wastes," etc.

In these times the barns were cold and the manure froze almost as hard in the tie-ups behind and under the cattle as it did in the yards outside. No grain was fed except to the fattening oxen. The cows gave no milk during winter, and the young stock went out from the dark refrigerators to pasture, in spring, lighter than when they were put in the barns in the fall. Those were some of the conditions that our predecessors in the work of agricultural enlightenment had to deal with.

Deep plowing had been practiced and "put her down to the beam" was the watchword and the accepted key to successful crop growing. Deep late cultivation of the growing corn so as to check too great a development of stalk, and turn the energies of the plant to the production of grain was a theory looked upon with much favor, and we ourselves have followed the heavy cast-iron toothed cultivator many a day when the plants would sway from side to side as we tore off their roots of support in passing.

The cattle were of the native stock or with an infusion of the blood of some of the English breeds. The growing of working oxen and sheep furnished the chief revenue of stock husbandry.

While it would be unreasonable to claim credit to the Board of Agriculture for all the advance during this period of time, yet the fact remains that it has been a chief factor in bringing into practice the enlightened systems of agriculture that we are now practicing. The agricultural press has been a powerful educator of our workers, and its influence can hardly be measured, but the yearly reports of the Board of Agriculture have been placed in the hands of almost every farmer and being in bound volumes they have been preserved and have become a part of his working library. The analytical subject-index first printed in the report for 1897, and continued in those for 1898, 1899 and 1900, places the matters treated in all of the reports before the reader at a glance, making a reference easy and quick. The subject matter treated in them has always been of a practical nature and relative to the every day interests of the farmer, rather than exhaustive and scientific essays that might be passed over unread by those whom they were designed to benefit.

The first attempt to make dairying of importance was undertaken in the early seventies when speakers were brought from New York to address the meetings. This was followed up and some sixty or more cheese factories were erected and operated during the two or three years following. The industry did not prove permanent, as it was managed, for the reason that it was not an all-the-year-round business, and the introduction of the Jersey cattle a few years before had laid the foundation for butter dairying, which was now taken up because of the financial advantages that it offered.

While all of the sessions were devoted to the best interests of agriculture and the members were earnest and enthusiastic in the work in which they were engaged, they frequently differed in their views and unless one was able to back his theories with data or personal experience his position was questioned.

At this time there were several large herds of the beef breeds in the State and there was a very strong disposition on the part of their owners to belittle the Channel Island cattle, and at almost every session the arguments between the beef growers and the dairymen did not lack spirit and interest, while the advocates of general purpose animals laid low and tried to hold their ground.

The wool-growing industry that for years was a most profitable occupation yielded to mutton and lamb growing, and the Merinos gave way to the Downs.

During this period the State gained an enviable reputation as the breeding ground of the trotting horse and she still enjoys the homage paid to her by the seekers for animals of beauty, speed and endurance.

The State has prospered wonderfully in her agriculture. Apple orchards have multiplied and the fine quality of our fruit is acknowledged everywhere. The canning of fruits and vegetables has become a great source of revenue to our cultivators. We have breeding establishments in almost every town where pure-bred cattle, sheep, horses, swine or poultry are bred and disseminated among the farmers, and our stock for special lines of work or production has become of a high order.

The preservation of green and succulent food for winter cattle feeding has been proved practical and desirable, and silos for storage purposes are being constructed in every neighborhood.

The fields are smoother, better drained, deeper worked and better tilled than ever before. The farm buildings are better and more convenient, the farmer lives in a better house, is better fed, better clothed, and better read than he was fifty years ago, and he is far more independent in his thinking and action. This work of the evolution of the farmer and his business is in a great measure the result of the wisdom of the State in providing for him, through the Board of Agriculture, special instruction in the various lines of his vocation.

ISLAND SHEEP.

By L. B. HARRIS, Lyndonville, Vt.

It is the duty of all people to foster and develop the natural resources of their country.

The State of Maine has along its rugged coast opportunities in the line of sheep husbandry, that to some extent create wealth and its comforts, but the industry is capable of great extension. The Islands are an ideal sheep home. The sea protects them from vermin, and of the almost thirty parasitic diseases that assail their kind on the main land not one can gain a foot-hold there. The spruce and fir groves afford shelter from the wind on many of the islands, and the fir bark and twigs are a corrective and food well understood and appreciated by old shepherds. In fact, neat cattle and horses were often wintered on the growth of the shrub, a generation ago, and two hundred years ago unanimously so, while the sheep from its construction and tastes thrives well on such herbs.

On the islands where there are no trees the sheep finds competent protection in the rocks that break the wind. In the current number of the London Live Stock Journal there are seven advertisements of canvas fences for protection to sheep in lambing time. Any shepherd of experience in the great sheep raising sections will tell you that a break for the wind is the only cover a sheep should ever have, and where sheep raising is carried to perfection, an all round sheep is never under cover. Given a dry place to lie on, and a rock or knoll to break the wind, a sheep of our kind is far better off than in any other condition. In a much more rigorous climate than the coast of Maine, the writer has not housed his sheep for many years, and he has the distinction of selling his mutton for a higher price than any man in the world; and a sheep responds quicker to bad or good treatment than any other of the domestic animals. More sheep are killed by shelter than through all other causes combined.

In the matter of food the Island sheep is better off than is any of his kind anywhere. Twice every day the grand old sea feeds him, with a regularity that is more certain than the shepherd's watch. His feed is laid at his feet, a feed that can not be excelled by any of the grasses and that is nearly equal to the leguminous plants. Too much cannot be said in favor of the sea food for sheep; but in that connection let us refer to the proposition that we laid down in the beginning of this article; it is a natural resource of the great State of Maine and should be made the most of. Having observed much of the Maine island sheep husbandry and of the practices in other parts of the sheep world, I can state unhesitatingly that the cultivation of rape with a liberal hand on those parts of the islands that are capable of cultivation will increase the output of mutton and wool very largely, precisely as the cultivation of that valuable legacy from our Indian predecessors, corn, or any plant or root, augments the earnings from the dairy or stock farm. I imagine that one of the most practical ways in which one could do good to his fellow men, would be to distribute rape seed to the farmers along the coast, with the simple directions for its cultivation. It would be a happy state of affairs if the Department of Agriculture, through the members of Congress, would send out small packages of rape seed, which costs almost nothing, instead of many kinds of seed which they do distribute.

Again, nature has placed in your hands just such sheep as are best suited to your needs, fine boned, well covered with wool and flesh, bright of eye, quick witted, ever alert, with head and ear erect. There is but one way to improve upon the breed, the way open to all breeders of live stock, that of selection. The advice of an old sheep man would be, do not mix any outside blood, but if you must get a ram from the main land, sell the produce, which will be good, but do not keep it to breed from, either rams or ewes. If you do you will make a slow, dull cross that will hurt the rugged, hardy constitution they now have, as well as the quality of the mutton.

There is no mutton in the world that excels the island sheep. The natural conditions prevailing there guarantee that. A little effort and "community of interests" would make a market for those sheep, and if placed upon the market separately long enough to get recognition, would bring a special price. This should not be overlooked nor neglected.

Then the conclusion is this: Cultivate rape; of course that means turnips, cabbages and kale, as well as rape, if your conditions make it desirable.

Improve the breed by selection.

Don't waste your money or time on buildings, as a wind break is better and cheaper, but put all your energies into more feed and consequently more sheep. This will give you a lamb of as good weight as you now get your wethers.

Look upon yourself as the natural protector of your flock; watch its enemies and fight them with a shepherd's pluck; take care of them in every way and they will repay the effort.

Back of the practical questions, in which light we have so far discussed this matter, lies the question of the origin of these sheep. I believe that the matter has escaped notice, but the proof is quite certain that these same sheep have lived in an unbroken line since two hundred years before the state was settled by the fathers of the present inhabitants.

When France held this country, its policy was to trade with and to convert the Indians, but it forbade and discouraged anything like a settlement of self-supporting people. The governors sent out advised a change. The Jesuits argued for genuine settlers, but the Crown would not consent, and is it any wonder that some venturesome spirits secretly formed a colony for these coasts and brought with them their cattle, horses and sheep? Chance brought them near the division line between Maine and New Brunswick. There they settled, to get discouraged after about a year and a half and go home. They left some of their live stock to run wild. More than a hundred years after, a Jesuit, put ashore by his enemies to die, found not only the sheep but the cattle still alive. But I can find no trace of the cattle later than that time. Probably the improvidence of the Indians had more to do with their disappearance than anything else. One of the early missionaries says that they will cut down the tree to get the apples. But the sheep, tucked away on the thousands of islands, could not be exterminated even by their savage carelessness. The conditions were so natural that they endured it all. They not only throve in their own country but they spread towards the South, and Livingston in the beginning of the last century says that in his day they had not been all killed out, and that on Narragansett island there were large flocks of them and they were then esteemed a most useful breed. He says they were locally called the Narragansett sheep. But it is not shown that they ever got south of Rhode Island.

Let me again urge those who are situated so they can help, to do their best to strengthen this industry.

THE SNOW ROLLER FOR WINTER ROAD BREAKING.

By E. C. BUZZELL, Road Commissioner of Fryeburg.

I am wholly unable to present this subject as it should be presented. All I can do is to give you a few facts about these snow rollers, as I know them from experience. Perhaps it would be well, in the first place, to tell you something of the way we are situated in Fryeburg, and what we have to contend with in our winter road breaking. Fryeburg is situated in the valley of the Saco, and we have something over one hundred miles of road in town, of all kinds and conditions, from the smooth road of the intervales to the steep hills of a typical New England town. Some of the roads are swept by the winds that come almost uninterruptedly from the White Mountains. We have almost every variety of road to contend with. Fryeburg is quite a shipping point. There are roads running from Lovell, from Stow and from Chatham, N. H., and it is quite essential that we have good winter roads. We have to depend upon a winter road from three to five months each year, and we have severe storms. We used to break them with plows, harrows, sleds, drags or anything else we could get hold of, and then struggle along until the roads got trodden. And after the snows got deep we would have to watch to see where we should meet the next team, and perhaps shovel a place. We began to think about something better to break our roads with, and in 1888 we built our first snow roller. The following year we built two more, in 1891 two more, and last year one more, making six which we now have in use in town. These rollers consist of two drums each five feet in length and about seven feet in diameter. They run on a steel axle or shaft, set on a quite solid frame, with a small platform in front and rear, making a chance for extra weight and a chance for a seat for the driver. They make a road, including the ridge, of about 11 feet in width, wide enough for two teams to pass each other anywhere, and that is one of the great advantages of these rollers, we think. They roll the snow down solid enough so that two heavily loaded teams can pass each other without any trouble. I frequently haul loads weighing five tons or more, and have met teams equally loaded, and we can turn out anywhere. I consider good, solid oak the best material out of which to make these rollers. They may be made smaller and lighter than those I have described and still produce good results on narrow back roads where there is not much travel except single teams, but we must remember that we must not sacrifice too much in weight in order to make them go easily. We must have the weight in order to pack the snow solid. We have one roller that makes a road 13 feet wide, and I think they might be made still wider and work well. We make them in two sections or drums, with a frame running through the center to which the shaft is fastened. The roads are rolled down smooth and flat, and I do not think they drift nearly as badly as they used to. I consider it very essential that all the hedges, bushes, and other obstructions along the sides of the road in openings where it is liable to drift should be removed. Not only are the bushes along the side of the road unsightly in winter or summer, and an obstruction for the snow, but they often shut out from view a bit of scenery that would be a positive pleasure. I thought yesterday that I had quite a good illustration of this. I was going over to Fryeburg village, from my home. There is a steep hill which I have to go over and the occupant of the farm had not kept the roadside cleaned up. The bushes had got quite high, and last week I had them trimmed out. I met a team on this hill, and they were stopping to admire the view. It was a beautiful bit of scenery. They looked down upon the river winding along, across a broad sweep of intervale, in fact across Secretary McKeen's homestead, and the mountain range beyond. I thought then that anything which we could do to add any beauty to our roadsides was a good thing, as it would make our roads more popular as drives. In this day when so many are looking to our good old State of Maine for a place in which to pass their vacations, anything we can do to make our roads better will certainly bring a return in dollars and cents. For this reason, if for no other, we should clean up the roadsides. Besides this, in a great many places these bushes have been allowed to grow almost up to the wheel track, and they are certain to cause mud in the spring and fall, and in the winter where it is liable to drift they will cause drifts. All board fences and other obstructions should also be removed. I can remember when in a great many places in our town there were road fences, and it was almost impossible to keep a road so that any one could get over it. Now nearly all of these fences have been removed and the bushes cleaned up, and it certainly is a great improvement, and adds much to the beauty of the farms and of the roads, and we hardly ever encounter any drifts that bother us. It has cost Fryeburg for the last five years about an average of $600 a year to break its roads. It is a severe storm in which it costs more than a dollar a mile to open the roads, and in ordinary storms we get our road, about 100 miles, open for about $60,—60 cents per mile. It requires six horses to draw one of these rollers, and once in a while it takes more team, but not very often. This allows also for an extra man or two to go along and shovel the drifts enough to get the horses through, if there should be any drifts. We have a good road all over town within two days after a bad storm. I do not think I could give these rollers any better recommendation than to say that after 12 years of use I think you would find the citizens of the town unanimous in the opinion that we get a better road, and with less expense, than in any other way. Since Fryeburg adopted the use of these rollers the adjoining towns of Denmark, Lovell, Brownfield, Sweden, and Chatham, N. H., have also adopted them, and Stow is to build new ones this year. These rollers built of hard wood, of the dimensions given, have cost us from $75 to $100 each. Perhaps in other localities timber might cost more, but I think we can build a good roller of oak, that will make a road 11 feet wide, for about $75. The frame should be well painted and the surface of the roller that comes in contact with the snow should be well oiled or shellaced to prevent the snow from sticking. We also have a scraper in the rear to clear the snow off. I do not think we have had a storm for the last five years in which it has cost us ten dollars extra for shoveling, on the 100 miles of road. Last winter the hardest storm was two feet or more of heavy snow. Of course that took extra team, but we opened the roads without any shoveling. It will take six horses to haul one of these rollers in 18 inches of ordinary snow.

Ques. What is the condition of your road in the spring when it begins to thaw?

Ans. It works very nicely. It thaws away about level, and works very much better than a road broken with any other method.

Ques. How do you manage to get over the town quickly after a storm?

Ans. These rollers are situated in different parts of the town. We have one at the village, one at West Fryeburg, one at the north end of the town, one at the center, one at East Fryeburg and one in another neighborhood. And I would say that we are to build another small one for use on a road where there are but four families. The town voted, without a dissenting voice, to construct a small one for their use. These rollers are stationed in the different districts, and the town is lotted off into sections, and the work of drawing the rollers is let to responsible men either by the day or by the trip. These men have a certain amount of road to go over whenever it needs it. These six rollers usually cover nearly all of the 100 miles of road in one day.

Ques. Do most of them go out and back on the same road?

Ans. We have several sections where we can go out on one road and back on another. We do this wherever we can, of course. In some sections we go over the same road twice. We have a section roller to use on some roads that we have to go out and back on, made with the frame the same as the others, but with smaller rollers, three feet in length. It is quite essential to make them as large in diameter because they roll much easier. I never should make one less than seven feet in diameter. This roller is made with set works in the center so that after you have been over the road once you can throw the middle of the shaft forward, and pass back over the road taking another part of it, making a good road about 12 feet wide. On a very narrow road I should not use it because it is more apt to be working off and on, perhaps working into the ditch. I think the best roller is made in two solid sections of whatever width you wish to break the road.

Ques. Can you haul heavy loads over the roads immediately after they are rolled?

Ans. Yes, they will hold almost always. It will cut in but very little. After a night or two of freezing they will hold a little more, but there is no trouble in turning out at once. Of course they will not tread two tracks. There is a ridge in the center and they go on each side of that, making a single track road with this roller track outside, that is wide enough for teams to pass each other.

Ques. You say you shovel but very little; is it your aim to throw the snow away out of the road, or do you just make a path for the horses and allow the roller to take care of it?

Ans. The less side you get the better, in shoveling. If a ditch is formed, as soon as the wind blows it is going to catch the loose snow and fill right up. The roads are rolled down very nearly level. We have lots of road on the intervale where the wind gets a sweep for miles, but where there are no bushes left the snow keeps right on going; it never stops more than a few inches deep, and does not pile up in drifts.

Ques. How much below the surface does the roller go?

Ans. That depends a great deal on the quality of the snow. Some snow is damp and heavy and will not roll down as much as other snow. Sometimes it will cut down a foot or more. If you have the weight it is going to roll it right down hard.

Ques. Is the axle that passes through the two drums in one piece or two?

Ans. On the whole roller it is in one solid piece. On the section rollers it has to be set in the frame work in the center, and is in two pieces so that it will work forward or backward, and hold the drums in or out as you wish.

Ques. What is the thickness of the lumber which you use on the surface?

Ans. A two-inch oak, or about two and a half hard pine. That is spiked on, and then a band like a wheel tire is put around each end. They are built very much on the principle of the land rollers.

Ques. Do you know of any firm that manufactures these rollers?

Ans. I do not. We have always built ours in town, and I think the adjoining towns have built theirs. They can be built very easily.

Ques. When you have a very damp snow do you ever, under any conditions, have to wait for it to freeze before breaking with the roller?

Ans. Sometimes, if they are not oiled or shellaced well. We have had a few cases where they would stick. But there is one roller right in my own neighborhood that I have had charge of for four years, and there has never been a day but that I could go with it. I have used it in almost every condition and never have had any trouble.

Ques. It would be far preferable, then, that the planking should be planed, would it not?

Ans. Yes. I should build them as smooth as possible. They can be very easily jointed so that the drum will present a very smooth surface.

Ques. What do you build the ends of the rollers with?

Ans. Some are built solid of plank, but I think the better way is to build them out of about 4 by 6 wood, and build them something like a wheel, an open frame, with wood across. Then the air can circulate through, and any dampness dries right out. We built one or two tight and they dozed out inside so that we had to repair them. But a roller built in that way, and kept well painted and oiled and housed, without question will last a good many years.

Ques. What are the dimensions of the steel axle?

Ans. About two inches. I would have it solid enough so that there would be no danger. We have some larger. Where the bearing comes near the frame on each end there is a steel or iron collar bolted to the frame work, for it to run on.

Ques. Is there anything between these two drums in the center, or do they simply come together?

Ans. In the center the frame runs back from front to rear, making a space of about ten inches between the two drums, and the shaft passes through that. I think there have been one or two instances in which they have been made in one solid roll, and it would not work well. You can get the drums very near together, within two or three inches, by having an iron frame.

SOME ERRORS IN ROAD BUILDING.

By J. A. Roberts, Norway.

I have been asked to make some remarks on the subject of Good Roads. I suppose that each of you appreciates the importance of this subject, but I am afraid that our farming people, as a whole, do not. This is one of the most important subjects with which you as farmers, and with which the people of the State, have to deal to-day. You toil day by day, year in and year out, to produce those products which, when sold, shall furnish you the means to provide your families with the necessaries and the comforts of life; means whereby you can educate your children and fit them for the work they will have to do in life; means, a part of which, you wish to lay by for that day which is coming only too quickly when from age and weakness you will not be able to earn as much as you did in your younger days. We are using the most modern and improved machinery, we are making use of new and improved processes, we are availing ourselves of all honorable applications of the forces of nature, and the object of this is that we may bring the cost of what we have to sell down to the lowest possible point. That is what we are all aiming at. We are struggling for economy in production. We sometimes preach economy in consumption, and of course that is well; we should be careful and frugal, but what we are really after is to be economical in production so that we may have more of the comforts and luxuries of life to consume. You have a field that contains many stones, that is rough and difficult to mow. You are obliged to mow around these stones with your machine and then send a man to clip what is left. You say that you do not like that, and you go to work, and take money, and clear the stones away and plow the field and lay it down smooth. Then you throw away the old machine that would cut four or five feet and buy one with a longer cutter bar, six feet or even more. In this case you see that although you have put out much money, in your future operations you make a gain. A field that formerly it would take you six hours to mow you can mow now perhaps in five. You are saving an hour's work for yourself and your team, and are not obliged to send a man to clip around the stones. You will never get that money back again, but you believe it is true economy because you can produce more cheaply, it will not cost you so much to cut your hay. For the same purpose you put in silos. They cost money, you can never get it back, but they keep your rough forage in a way that is much more economical than any other way in which it can be kept, and so in the end you are spending to save. For a further illustration, take the dairy business. I remember as a boy that we carried our milk into the cellar and strained it into large tin pans, or earthen pans, and then it was covered and after staying there 24 hours it was skimmed, and my mother had all this large array of pans to wash every morning and every night. There was a good deal of labor to it. By and by the cold process of setting milk came into existence and the old one went out. Labor was saved and it was a more comfortable way to do work, and we invested our money in cream tanks and cream cans. Of course we did not expect ever to sell them, we never could get that money back, but we were going to save in production. Now that system is passing out in a measure and the separator is coming in. We take the milk warm from the cow and put it through the separator, and the work is soon over. We are not so much troubled with getting ice, we separate the cream from our milk more cleanly, we are getting more cream; and although the machine itself costs considerable and we will never get that money back, we are saving in the cost of production, and that is what we are aiming at. And so it is in all our farm operations. After you have produced your products and got them ready to sell you avail yourselves of the very best of wagons to take them to the market. You are doing all this to save in the cost price, and of course that is right. I fear many farmers do not figure enough in that matter. Many of us are apt to think that we have but little to do with the cost of transportation, that must be paid by some one else; but I think this is wrong. You may have the best goods in the world. You may not have to go to Portland or Boston to seek a market; your goods may be of so good quality that the buyer will come to your door and take from you the trouble of shipping them, but when the returns come in the cost of transportation to the market where these goods are to be distributed is taken out.

Let me give you a little illustration. I raise sweet corn, and I can put a load upon my cart and haul it to the factory and return in 2½ hours. I can make four trips a day. An acre of corn will produce something like three loads, so that reckoning the team at $3.00 a day, $2.25 would be the cost per acre of transporting the corn to the factory. Now I have a neighbor who lives a longer distance from the factory than I do, so far that he can go only twice a day. You can see that to get an acre to the factory he has to work a day and a half while I work ¾ of a day. It costs him $4.50 an acre to get his corn to the factory. He is paying for transportation. When the corn is there we get exactly the same price, but he has to pay $4.50 per acre for transportation, while I pay only $2.25. You all realize, if you have thought of this matter, that the producer is paying the cost of transportation. A manufacturing company builds its factory or mill close to the railroad in order to save cartage. In transporting goods you have to pay cartage as well as the freight upon the railroad. You ship goods to Boston, New York or Portland, and it may be that the cost of cartage from your homes to the railroad station will exceed the freight upon the railroad, that is frequently the case. Now consider the billions of bushels of grain, the hundreds of millions of bushels of potatoes, the millions of pounds of cotton and wool, and all the other farm products in this great country that are subject to transportation. They are all transported over our carriage roads, and not only that, but the articles that we as farmers consume, those things which we buy for the support and comfort of our families and the raw material which we use in feeding our lands and in feeding our stock, all must be transported back from the railroad station. It may be possible that the cost of cartage in this country, the carrying of the goods from the farm to the station and the bringing of the goods from the station back to the farm, exceeds the total cost of the railroad charges. I have not figured this, but I should not be surprised if it were so. And this cost of cartage must be borne by the producer and not by the middle-man. Then think of the vast amount of our products that are going to Europe. It may be that this cost of cartage over our roads will be the deciding point whether our goods can compete in the market with those from other places of the world. But I will not dwell any longer upon this matter. I hope you will take it into your granges, and into your families; that you will pursue this line of thought further, and consider the importance of this matter to our welfare as farmers and as a State.

Now I wish to point out what I believe to be some of the most palpable errors in road building as it exists to-day. But before doing this I wish to make the statement that I do not believe the roads of the State of Maine are any worse than the roads of other states in the Union. I will make the assertion still stronger. I believe there are very many of the states of the Union whose roads are away below ours in condition. We have many good roads in the State of Maine to-day, many roads that are well fitted for the traffic that is to pass over them; but for all that we must admit that there is need of improvement. We see hills that are difficult of ascent and descent that should either be cut down or gone around; we see many long stretches of wet roads, where the wheels will cut in 4, 5 or 6 inches; we see many other poor roads, sandy roads, etc. So that while I claim that the roads of Maine are better than in many other states, there is a great chance for improvement.

I think the first mistake our people are making is in the town meeting. You will find that there is an article in the warrant asking you to raise money to repair the roads and bridges; that is all right, the law requires it and you should do it. But too often there is nothing else done. There is no permanent work done. I would have every town have two articles in the warrant, or two clauses in one article, if the law will permit, and if not I would have the law changed. One article should ask the town to appropriate money for the ordinary wear and tear of the roads and bridges, and the other article should ask the town to appropriate money for permanent improvement. There can be drawn readily a distinguishing line between these two. At present I know that very many towns are using all the money that is appropriated for just the ordinary wear and tear, and undoubtedly some of it is spent needlessly, or not wisely. But if we got in the habit of appropriating money for permanent work we should begin to think about that a little more, we should begin to study the roads, and to ask ourselves what road or what portion of the road needs to be improved most. I believe that under the present system the law requires us to spend two-thirds of the highway money before the 15th day of July. That is a wise provision, undoubtedly, because many road commissioners are a little dilatory, and delay their work until so late that they lose the benefit of it for that season. But for permanent work I believe the town should be allowed to use the money at any season of the year. If you have a stretch of wet road to drain, you can do it much better in the fall after the land has dried, than in the spring. So I believe it would be a good idea to have the law changed in that respect, and give our towns the privilege, if not instruct them, to raise money for permanent improvements and to expend it at any season of the year that is thought best.

There is another mistake that is made, but I hardly know how it can be corrected except by using our common-sense and not letting our selfishness run away with us. This mistake is the appointment of the wrong man for road commissioner. The common-sense view of the matter to me is this: You should select the man in town who knows the most about it. Any man who has done anything in any line of work ordinarily knows more about it than other men who have not. He knows what the difficulties are, he learns something from his experience which no man can learn in so thorough a manner from observation. It seems to me that in the choice of our road commissioners we should always have in view the best man for the work, whether he belongs to your party or to my party, whether he is a particular friend of mine or not, and without regard to whether I am to get a job or not. In many of our towns, men are apt to use their influence for the man that will give them a job on the roads.

Another mistake that I find is in the matter of drainage. Men will build a good appearing road, all right in shape, and put good material into it, but they forget to underdrain it, and the drainage is just as essential as the drainage of land upon which you raise your crops. If you take a piece of land and cultivate it and do not drain it, you are apt to get poor crops. The light and air and heat cannot get in. But if you underdrain, the conditions are changed, and that may prove to be your most productive land. The same holds true of a road. If it has not proper drainage this should be the first thing to be considered.

Another mistake that I have found is in the construction of the water-ways. I have seen men make a little cross-way for the water to run through that a woodchuck could hardly crawl through, when it needed one that was two or three feet each way. A little water-way like that will answer the purpose of a dry season, but in a wet time it soon becomes obstructed and the danger is that there will be a washout of greater or less extent, and the road builder must spend more or less money in repairing that road, when if he had taken the same money and made his water-ways large enough to meet all conditions he never would have had this washout. I believe there are thousands of these small water-ways in the State of Maine today. I know, personally, of a great many of them in roads over which I have traveled. I think one of the great mistakes that our road makers are making today is that they are not putting into runways for water size enough, and further than that, I find that some men do not build these water-ways as they would put in a foundation for a building for themselves. If they were to build a large barn they would make the foundation solid and secure, so that it might stand there as long as the barn, but they are careless about these cross-ways, and put them in in such a way that oftentimes within five years they have to be taken out and new ones put in at an added expense.

Since the advent of the road machine I find another mistake. I have in my mind's eye today a road that was made this year that is exceedingly narrow. The first thing that will come to your mind as you go upon the road is that it is an exceedingly narrow road; and on each side is a deep ditch. We could endure the narrow road—wide roads are not necessary in most parts of the State where there is simply carriage travel—but this road has ditches of such depth and its shoulders are so square that by going a foot or two to either side, the wagon wheel will be off in the ditch and you run considerable risk of being tipped over. I have traveled over that road considerably since it was made, and I know that when two carriages meet it is a difficult matter for them to pass without being disturbed in their position, and if a carriage meets a loaded team it is impossible for the loaded team to turn out without risking tipping over, it cannot do it on account of the shape of the road. If two loaded teams should meet on this road I hardly see how they would get out of the trouble.

Another mistake that the road makers are making is in the material that is put into the roads. I saw a road built this year with a road machine which passed up one side and down the other and drew into the center of the road all the sods which were the result of the growth of the grass there for a number of years, all of the leaves and dead grass in the ditches, and the worn-out soil that had once been a part of the road bed but had been blown or carried by the waters to a little distance. Then, men with hoes came along and smoothed it up as well as they could, but the road was very rough and uneven to drive over. It occurred to me that that material was fit and would be nice for the bottom of a hog pen or the bottom of a barn-yard, but it was wholly unfit to put upon a road for people to travel over, and why any man should put that stuff upon a road is beyond my comprehension, though I have known many road builders to do it. Sods are not fit to make roads of, and grass is not; and the old, worn-out soil, that has once served its purpose as a road bed and has become fine, is no longer of any use. This road that I speak of was, before it was repaired, a hard and firm road, pleasant to ride on, but today all that material has been ground up and powdered and when the wind blows it is exceedingly disagreeable to ride over it.

The old idea was to repair the roads in June, and a little bit before the ground froze up, and that was all. That idea is still held by a great many road makers, but I believe it is entirely erroneous. The roads should be repaired constantly. The minute there is any wear and tear upon them it should be repaired. There should be somebody looking out for the roads all the time. If there are cobbles in the road as the result of a shower or from any other cause they should be removed at once, and if a road becomes washed it should be repaired immediately. All these things should be kept in mind by the road commissioner, and I believe that repairs made in that way will not cost as much as if you allow a little thing to grow into a big one.

There is another condition of the roads that I have noticed. You will quite often find a road that is wide, a road on which there is considerable traffic, a road wide enough for three teams to pass abreast, but a road which has sunk down in the center. The material has been ground up and blown out, so that the sides of the road, what was once the shoulders, are a little higher. You will find many of these roads, and you will find in them pebbles, small stones, and irregularities in the surface. I believe it is a mistake for roads of that class to be left in that way.

I want to speak of two roads which I have seen this summer in the same town, built by different men. I have referred to one of these. Your attention would be called first to the fact that it is a very narrow road, with deep ditches, so that to my mind it is absolutely a dangerous road. The next thing you would notice about it is that it has very poor material on top. All the grass and sods, and everything of that sort, have been drawn into it, making it a very uncomfortable road to pass over, and a very slow road to drive a team over. Then you will notice that it runs in a zigzag way. The road bed itself was quite straight, but somehow in making the road with the machine they went in a zigzag manner, and when work was done with hoes it was not straightened, so it made an unpleasant appearance.

The first thing you would notice about the other road is that it is a good broad way, and the ditches are shallow; there is plenty of room for the water to run away, and if you meet a team you can drive into the ditch with one wheel without any risk. The next thing you would notice is that it is made of the very best material, there are no sods or grasses in it. And the road is perfectly straight, running between those farms for long distances. When you strike that road you say, "I respect those farmers, see what a grand road they have!" And you begin to ask who is the maker of this road, and you will say, "Here is a man who knows something about road building," while you will put down the other man as one who knows nothing about it, not even the first principles.

I have gone over these things because it has always seemed to me that there are a great many men building roads in the State of Maine today who do not know the A, B, C of the business, and I have always believed that by talking these things over in their presence or in the presence of their neighbors, by and by a higher standard of excellence in road making would be reached.

Now I want to say a little something on another line. An effort has been made in this State for some years to provide a State highway commission. There is in the State of Massachusetts today such a commission. That commission was appointed to study the roads of Massachusetts and make recommendations for their improvement. After the recommendations were made they were adopted, with others, by the legislature, and that commission continued as a state commission, and the State of Massachusetts today is making stone roads under the management of this commission, the appropriation for which is made by the state. The State of Massachusetts is putting a part of the cost of these roads upon the tax payer today, and a part it is putting out in bonds for future tax payers to pay. The stone roads of Massachusetts cost about $9,000 a mile. The state has provided that within a certain length of time the county should pay one-fourth of this back.

In New Jersey there is a law that provides that two-thirds of the landholders along the line of a mile of road, or those owning two-thirds of the land, may petition the county officers for an improved road, and signify their willingness to pay ten per cent of the cost. Then the county commissioners, or the county officials who have charge of the roads, go on and improve those roads and the state pays one-third, and the county the other two-thirds, deducting, of course, the ten per cent. In that way they are building stone roads. Those roads, at first, cost $6,000, but today they are costing only about $3,000.

Now I was opposed to the State of Maine having a highway commission, because I could not see how we could get the money to meet the expense of building such roads, and I believe that if we had a commission they would recommend such roads. I do not believe it would be prudent for the State of Maine or for the counties of the State of Maine to go to selling bonds to procure money with which to build stone roads. That is my present belief, and it has been my belief for a number of years, but at the same time I believe that we should make a start in that direction. I am not prepared to say what would be the best way, but I do believe that there are many communities in the State of Maine today that need stone roads and can afford to have them, as a matter of true economy, and if there is any way whereby this could be brought about I should be glad to see it done.

One thing more I would like to mention, and that is in relation to the roadsides. The roads are laid out from two to four rods in width, but the road bed itself will not occupy more than from one-fourth to one-half of that, and along each side of the road bed is this narrow strip of land, fenced in by our fathers with a fence or a stone wall oftentimes, and this strip of land, rough, in a state of nature, became the dumping ground of the large boulders taken from the fields, cobble stones, the trimmings of the apple trees, old timbers, boards, etc. Everything for which there seemed to be no particular place was put upon the side of the road, and there the weeds and the bushes found a favorable place to grow. Many of these roadsides are unsightly and scraggly. The farmer of today is cleaning them up. He is moving the stone wall, plowing the roadsides, smoothing them off and making them of some value. It may be that he is leaving an occasional elm, whose graceful limbs bending to the earth beautify the wayside, or a maple or two, which, with their dense foliage, afford a cool shade for the traveller in the summer heat; or possibly a few stray apple trees may be left, whose brilliant blossoms in the springtime, and whose red-cheeked fruits in the autumn, afford pleasure to the passer by, who, seeing the changes that have been wrought in this roadside, thanks in his heart the occupant of the farm adjoining. To adorn and to beautify our roadsides not only gives pleasure to the passer by, but increases the happiness of our families, adds value to the farm, increases the respect with which the owner is held by his fellow citizens, and also increases the respect with which the town is held by strangers. I believe it should be the desire and the purpose of all road makers to encourage the cleaning up of the waysides, and that in their work as road makers they should not throw the stones taken from the road out on to grass or land which has been cleaned up, and that no obstruction should be placed in the way of the man who desires to improve the looks of his roadside.

I hope that I have thrown out some thoughts that will lead you to consider this question. It is not necessary for us to think alike, we are all entitled to our own opinion, but the main thing is for us to be discussing this matter. We shall never have much improvement in the roads of Maine until we begin to think about our roads, the importance of their improvement and the way to improve them. When the people once begin to think about these things, they will begin to study into the best systems of making and improving roads, and the improvement will follow.

DOMESTIC ECONOMY.

By Mrs. S. A. TAYLOR, Fairfield.

The terms domestic science and domestic economy convey to the mind of the busy housewife, ideas of rather a hazy and indefinite character. In her mind they are associated with parsimony and self-denial, while in reality economics is as far removed from parsimony as right is from wrong, or as light from darkness.

The derivation of the word economy is from two Greek words one meaning "house" and the other "to rule," and our word science comes from a Latin word meaning "to know." Therefore the original meaning of these two abstract words, was simply, "to know and to rule the house." Now we who feel that the making of a home is in our hands must certainly find this an important and interesting subject.

Many speak of it as something new, and we regret that as a study it is new in many homes, yet its pricinples are as old as time itself and have been practised for centuries. As the pilgrim fathers watched their little patch of corn grow and speculated on how they could make it go farthest toward supplying the many needs of their families, and the frugal housewife planned the different ways of preparing this one cereal, her only resource, perhaps they did not think of it as scientific work, yet in this very effort we find a fundamental principle of true domestic science—seeking to derive the most benefit from the time and means at our command.

All these years these rules have been applied to a greater or less extent until today the demonstrations that have been made and the literature within our reach, make it our privilege to be so conversant with practical economics that ignorance, even of details, proves a lack of interest on our own part.

Too many delicate women let the infinitesimal and innumerable cares of the household make their housework actual drudgery to them: rather should they become so familiar with the science (the *know how*) of all domestic affairs, that they may be able to overcome each separate difficulty and let the light of their own personality illumine each day's work.

Power over their environments is the pressing need of this generation, and the acquisition of knowledge is this power. And right here let me insert a plea that the elementary principles of the chemistry of food may receive more careful attention in our public schools, that the next generation mav have that power over their domestic environments which we lack from ignorance. It is of far greater importance that our girls know the relative value of different foods, than that they should correctly translate a Greek or a Latin sentence. It is said that nine-tenths of all our high school girls marry and become housewives. Now in their little cottage homes how many times will they have practical need of their Greek and their Latin? But three times a day through all the working years of their lives will they be expected to prepare an economical, healthful, and appetizing meal for their families. Are they fitted for this work? Are they educated for it? Our nation of strong men and women will degenerate physically and mentally unless the practical subjects of life receive more attention, and the public school is the place for this work. But methinks some gentleman will say, surely the mothers who have been housekeepers for a lifetime are able to teach their daughters these lessons at home. Perhaps you are right, gentlemen, but why send your sons to agricultural college? You have been farmers for a lifetime, why not teach them at home? I will tell you why. It is because you are aware that farming has become a science, and in order to grasp all the possibilities and reap all the advantages of the soil, the twentieth century farmer must have a knowledge of the science of agriculture beyond what the ordinary farmer is able to teach.

This is just the condition of the mothers and the daughters. Housekeeping has become a science and your daughters must learn its underlying principles, as they would those of any other profession. Then and not until then will our girls realize the importance and dignity of the housekeeper and the home-maker, the noblest position God ever gave to woman. There is nothing so conducive to real, true happiness, as intelligent, well directed labor in our own homes. But,

> "Home 's not merely four square walls,
> Tho' with pictures hung and gilded;
> Home is where affection calls—
> Home is where the heart has builded."

Here woman's influence is limitless. Her duties are many but her possibilities are many more.

Yet cold-hearted statistics tell us that bad management and ignorance in cooking waste millions of dollars every year and from an economic standpoint the waste in American homes is greater than in those of any other nation. In some cases where dietary studies have been made it was found that one-fifth of all the nutriment of the food purchased was completely and totally wasted. Now "half the struggle of life is a struggle for food" and our labor commissioner, Hon. Carrol D. Wright, tells us that this great labor question, that is agitating our people from East to West, concretely stated means simply, the workingman's struggle for a higher standard of living. Do we, as women, realize the important part that we must bear in this great struggle of life? If ignorance and bad management are wasting millions of dollars every year in this enlightened land, ought we not to apply every scientific principle that has ever been demonstrated toward correcting this enormous waste of food? Arouse yourselves, for upon your wisdom, your supervision, your executive ability, depend the happiness, the prosperity and even the character of your family. We are living, not in an age of idle dreaming, but in an age when the honest, earnest effort, is what demands and receives the respect of the world.

The nutritive value of food at first thought seems a complex question, and the woman of many cares turns from it impatiently, perhaps thinking as the little boy explained in school, that "nutritive food is something good for us to *eat*, but it hain't got no taste to it." Our Agricultural Department at Washington, our own Experiment Station at Orono and the Board of Agriculture have placed so much knowledge within our reach, that we can no longer shirk our responsibility by pleading ignorance.

Food is for three purposes, to repair the waste that is constantly taking place in our bodies, to supply heat and to furnish force and energy; and our food may be divided into three corresponding classes: The proteins, consisting of lean meat, fish, milk, beans, eggs, &c., &c.; the fats, consisting of butter, fat meat, cream, &c.; and the carbohydrates, consisting of starch and sugar and found largely in bread and in the vegetables.

In the extreme climates Mother Nature has laid down her own dietary rules. In the Arctic regions where enormous quantities of heat must constantly be supplied, the diet of the natives is seal and blubber, a perfect fat-forming food. The indolent people of the tropics make very little physical exertion and need no heat-producing food, therefore a diet of cereals and fruit is all they require. But in our own temperate zone we are given a bill of fare that ranges from the tropics to the Arctic regions, and the housewife must understand enough about the chemistry of food to give us (as experts would say) a balanced ration or our health will suffer. It is a lamentable fact that much more time and thought have been expended in analyzing and compounding a perfect and balanced ration for our animals than for our families.

I fully realize that this subject is so commonplace that it is hard to make it interesting, yet I will try to be very brief and we will take up just a few practical points.

Milk is considered almost a perfect food and it is well to remember that after it is skimmed it contains as much nutriment as before. The cream is only a heat-producing or fat-forming element and nearly every particle of the protein and nourishment is left in the skimmed milk. There are many different points of view from which to consider eggs as food. Their digestibility when fresh is almost perfect and this fact should be taken into

HOLSTEIN STEERS, OWNED BY F. L. WEEKS, ALNA.

consideration when comparing them with less digestible foods. The many different ways in which they may be cooked appeals to one who appreciates variety. Just one suggestion in regard to the most common method of cooking eggs, that is, boiling: when you boil eggs *don't boil them.* This may seem rather contradictory, but put the eggs into plenty of cold water and let them just come to the boiling point, and if you want a rare egg you will have it in all its perfection. If you desire a well cooked egg, let them stand in the hot water from 5 to 10 minutes. The albumen of an egg is not toughened in this way, and while it is thoroughly cooked it remains a jelly-like substance that is perfectly digestible.

We have been taught that vegetables contain but little food value, yet Prof. Atwater (than whom there is no better authority on food subjects) claims that recent experiments have proven that their value has been under-estimated and that more vegetables, well cooked, should be placed on our bill of fare. One word about cooking potatoes. Scientists tell us that if we peel them and leave them in cold water an hour before cooking, we waste quite one-fourth of all their food value, but if we put them into boiling water without peeling and cook quickly their food value remains intact and the starch cells of which the potato is so largely composed will remain dry and mealy. This same principle is carried out in cooking all the starch-containing foods, especially rice and the breakfast cereals. The object should be to have them well cooked, yet keep each grain separate and whole, and great care must be exercised not to break the starch cells. If rice is put into plenty of boiling salted water and cooked in the oven without stirring, each grain will be perfectly whole and there will be no suspicion of stickiness. For this same reason we lightly sift our rolled oats into boiling water and never touch a spoon to them.

Now let us not forget what a good friend the bean pot is to us. A good dish of baked beans is as nearly a balanced food as anything that has yet been analyzed, and looking at it from an economic view,a pound of baked beans furnishes as much nourishment as a pound of steak that would probably cost ten times as much.

Cheese is termed by many a luxury, yet our best authorities claim that one pound of cheese will furnish as much nutriment as two pounds of beef, and only when eaten in extremely large quantities is it less digestible than beef. In Switzerland the peasants very seldom eat meat; cheese almost entirely taking its place.

Many of the cheaper cuts of meat are made very palatable when properly boiled, but this requires as much skill as to roast. They should always be put into water that is boiling fast; in this way the albumen of the entire surface is coagulated and the crusty surface thus formed will resist the effect of the water and prevent the escape of the juices and flavor.

Should you keep up this extreme heat long enough to cook the meat, the albumen would all become hardened and the juicy, meaty taste destroyed; therefore the temperature of the water should be allowed to immediately fall below the boiling point and there remain three or four hours until the meat is tender. This careful cooking will be very gratifying, for the stringy, tasteless fibers often placed upon our tables are simply the result of fast boiling, extracting all the gelatine and coagulating all the albumen. The same principle applies in cooking a roast or steak, i. e., let extreme heat sear the surface to retain the juices. An easy and practical way to accomplish this with a roast is to put a spoonful of beef fat into an iron fry pan and heat very hot, then carefully hold the roast in your hands and let every part of the surface come in contact with the hot fat. Treated in this way the roast will not need such an extremely hot oven as it otherwise would.

With much hesitancy one speaks of bread-making. It is a food that comes on to our table three times a day every day in the year, and perhaps each housewife thinks her own particular method a little the best. Ever since the Egyptian women pounded out a handful of grain on a flat rock, and regardless of the particles of stone and dust that must have accumulated, kneaded in a little water, shaped it into little pats and baked it in the ashes; ever since that day the art of bread making has been progressing and receiving careful thought and attention.

This loaf shows the bread that is eaten by the Swedish people. It is made in this form (a flat loaf, with a hole in the middle like a huge doughnut) for the reason that it is dried on poles and kept for months; in fact, baking day, I am told, only comes twice a year in Sweden. This is a Scotch oat cake, the common bread of Scotland, and when I asked the kind-hearted Scotch gentleman who procured it for me, if it was genuine Scotch oat bread, he answered: "Soortainly, soortainly it's gee-u-een Scootch ooat cake, made by my oon oold moother from Scootland." This old Jewish loaf, I am told, is made exactly as the Jewish Passover bread was, nearly three thousand years ago, and one very sacrilegious old fellow once said that if that was the bread the multitude was fed on, he did not wonder that five loaves fed a multitude.* Many people object to the slightly acid taste that comes from combining yeast with milk, and today many of our best bread makers claim that water makes a superior bread.

Years of experience has taught me that water makes a finer flavored bread and one that will not grow stale so quickly. Now if you will pardon me I will give you my method in detail and ask you to test my bread.

To make six small loaves (three double ones) take three pints of very warm water, 95° is none too warm (for yeast thrives best at a temperature of from 75 to 90°), in half a cup of this water when only milk-warm dissolve the yeast cake and to the rest of the water add a mixing spoon of salt, a mixing spoon of sugar and one of shortening. The large quantity of salt gives flavor and the sugar gives the yeast something to work quickly upon. Now use the best "light bread" flour, for there is neither economy nor wisdom in using any other, stir in flour until you have a stiff batter, then add the yeast and beat (not stir) fifteen minutes or, as one good bread maker says, "until it all seems alive."

In winter make this sponge at night and put it where the temperature will not fall below 65 degrees; in the morning it will be light and full of air. Stir in what flour you can and then comes the real art and science of good bread making—the kneading. A little flour at a time should be added until the loaf is perfectly smooth, waxy and firm and does not adhere to the board or to the hands. Now give the loaf a good pounding with the rolling pin (this will help to make it of fine grain) and put back in the pan to rise. This done before breakfast and the

* Samples of different bread were shown as well as Mrs. Taylor's own make.

bread kept at a temperature of 75° or a little more, it will be ready for the tins at from 8 to 9 o'clock. If the bread was well kneaded the first time, half a teaspoon of flour will be sufficient to make up the small loaves, which only require kneading enough to get into shape.

When very light, bake in a rather hot oven until thoroughly done, for an under-done loaf of bread will cause more indigestion than twice the amount of any other poorly cooked food. One more point, never turn the bread when done, on a cloth, or put a cloth into your jar. Turn the bread out on a hard wood bread board and when cold put into a perfectly clean stone jar and you will never (in reason) have mouldy bread.

These directions seem very minute, yet perhaps we can afford to spend some time and thought in the preparation of a food that is acknowledged to be the staff of life. The art of bread making once thoroughly learned is a valuable lesson and one never forgotten.

Much might be said from a culinary point of view, yet domestic science would be restricted to its narrowest limit if considered only from a culinary and pecuniary standpoint.

The term is so broad that it includes the economy of health, time and energy as well as the wise expenditure of money. Today modern science demonstrates the principles that it took our ancestors years to grasp; we have no use for the old kitchen as big as a barn where our mothers and our grandmothers walked weary miles in the needless expenditure of time and strength; it has been demonstrated to us, that a small, airy kitchen with every inch of its walls utilized with drawers, shelves, closets and tables, is much more conducive to health and neatness. Show me a kitchen where every article needed for cooking purposes is within reach of the cooking table and where a high stool stands ready to offer a moment's rest, and I will show you a housewife who has time and energy to devote to the higher duties of her home life.

It was never intended that the sole object of life should be to make and to save money; money is only valuable as it supplies our needs and gratifies our tastes and desires. Were gain the only object in view, we would abolish the home and live on the co-operative plan, but the purpose of the sacred home is to build up and strengthen character and develop men and women of the highest, noblest type. The ideals that cluster around the old hearthstone are above material value; the memory of the dear faces around the old fireside has a heart value that is beyond comparison with worldly gain. Destroy these homes in all their purity and strength and you have torn down the strong fortress of the nation. There is no dividing line between these well ordered households and the social, mental and moral welfare of our republic.

We as farmers,—and I say *we* intentionally, for certainly the woman who lives a lifetime on a farm, interested and helpful in every part of the work, is as much a farmer as the man who plows the field and hoes the corn—I say, we as farmers are writing our record on the scroll of history for future generations to read, and we should each feel a personal responsibility in having this record reach the highest possible standard. Gov. Hoard when he addressed the National Congress of Farmers at Faneuil Hall about a year ago, told them that the greatest drawback and hindrance to agricultural thought, progress and profit was the lack of sympathy and union between scientific theories and the actual practices of the farm.

Possibly this very remark is applicable to the farmers' wives in regard to our present subject; and there is good reason for this feeling, for just as the farmer has worked out and gained his knowledge with his hands and "knows what he knows," even so has the farmer's wife in her years of isolation demonstrated many facts to her own satisfaction. It is not strange that they are both distrustful of new and untried methods; but now if science has better and more economical methods to offer, its helpful teachings should be included in the program of every farmers' institute, until this feeling of prejudice is overcome and until discussion is crystalized into action in every farmer's home.

Change, action and progress are the watchwords of the day and the time is past when a smattering of knowledge will suffice for any intelligent woman. To meet her ever increasing responsibilities she must be equipped with all the practical knowledge science has to offer, and she in turn must rescue science from the seclusion of the laboratory and place it where it belongs, in our kitchens.

When domestic science in all its different phases is more thoroughly understood, then will the beautiful art of homemaking have been raised to its proper sphere and the work in our farm kitchens will no longer be termed drudgery but will have been raised to a level with all intelligent labor, and the influence of these little homes will be such that from them will go forth, not the individuals that need constant curbing and restraining, but noble, strong natures that will grow and expand into all that is highest, noblest and best in the perfect man and woman.

REPORT OF PROCEEDINGS

OF

STATE DAIRY MEETING,

Held at Augusta, December 6 and 7, 1900.

ADDRESS OF WELCOME,

By Mayor S. W. Lane.

I have had no time to prepare an extended address of welcome, but I will say to you that the citizens of Augusta are glad to see you here. The city in its corporate capacity is glad to have you here, because when the fact was called to the attention of the city government that you were to be here they at once authorized and instructed their representatives to invite you to this hall and to tender you its free use. That is the corporate welcome. I can only say that I hope you will enjoy yourselves every moment that you are here. I hope you will so enjoy yourselves that you will come again and that you will come frequently, and that every time you come you will call the last time you came the best time you ever had anywhere in your life. Ladies and gentlemen, accept this as the greeting of the city and personally from me. I would like to take every one of you by the hand and bid you God speed in your work and a hearty good time while you are here.

C. B. BURLEIGH, President of the Board of Trade.

Mayor Lane has so cordially and so well extended to you the welcome of Augusta that I feel that there is very little that I can add to what he has already said. It is, however, a pleasure and a privilege for me, in behalf of the Augusta Board of Trade, to extend to you a cordial welcome to our city. The business men of Augusta appreciate fully both the magnitude and the importance of the interest which will form the basis of your considerations and your deliberations during your meeting. They are glad to have you meet here at the Capital, and in extending to you their cordial greetings I would also express the hearty wish that your stay in our midst may be as pleasant as we have no doubt it will be profitable.

RESPONSE,

By J. M. WINSLOW, President of the Board of Agriculture.

I hardly feel equal to the occasion, in responding to the kind welcome we have had from Mayor Lane and also from the Board of Trade, but I will say that I feel that we are welcome here and that it would be well for us, perhaps, to think for a moment what we have come here for. We have come here to compare notes, as it were, and see whether we are holding our own or whether we are gaining a little. We hope we are gaining, and we believe we are. We believe that the dairymen of the State have made an advance in the past year, that they are doing better work, that they are caring better for their herds and that they are making a better article of butter than they were a year ago, from the very fact that they are alive to their business. The scoring of the butter here may not bear me out, but I do believe from observation that there is an improvement in the care of our dairy herds, and as long as I can see the improvement there I have faith to believe that there is an improvement in the products. During this meeting we shall probably hear something said in regard to cleanliness. That is a theme that is always talked and always will be, because it is almost impossible to have absolute cleanliness in anything, but let me tell you that from many of the dairy herds of Maine you are getting as good, as clean and as sweet an article of butter as is being made anywhere, in my opinion; and we can continue to do this, because the dairymen are becoming alive to their business. We are glad to be here and certainly we feel almost at home here in this, the capital city of the good old State of Maine. We certainly shall have our minds directed more or less to the city among the hills during the coming winter when the men that we have chosen assemble there to look after the interests of the people. Mr. Mayor, in behalf of the Board of Agriculture, I thank you for this cordial greeting.

OUR DAIRY WORK.

Lecture before the State Dairy Conference at Augusta, Dec. 6th. By Prof. G. M. Gowell.

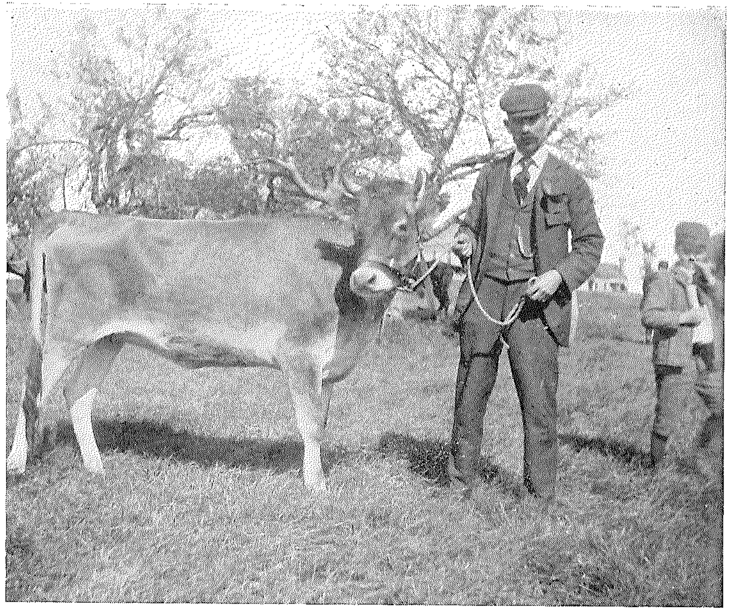
I hardly know how to talk to you today, for the reason that I have talked so many times before at the commencement of our annual sessions. While necessarily there must be a great deal of repetition in what we may say relating to our work, yet conditions do so change from year to year, that it becomes a new subject and one that we are vitally interested in.

In comparing this season with previous ones, and its prices with those of former years, we may have some occasion for comment. We know the conditions through which we have passed this year. The intense drought that prevailed, shortened the grass crop and deficient pastures resulted, causing a very material shrinkage of milk in August and September. This has told very much upon the product of our herds for the year. We have, on the other hand, the satisfaction of knowing that prices have been higher than for a long period of years and have been well maintained, particularly during the season of the year when they have usually run lowest.

In obtaining data relative to our work I have pursued the same methods as in former years. I have gone to the creamery managers and from them have secured the amount of their output, the amount of money they have paid the farmers, and as near as they could tell, the number of cows that contributed milk or cream. The assessors' returns show that we have a few more cows than last year. Last year we had 143,000, in round numbers, and this year 144,000. This increase, while it is not great, counts for something. But in computing the number of cows in the State it is hardly fair to take simply those that are enumerated as cows. We have some 26,600 three-year-old animals. This includes males and females, but if we apply the same percentage to the division of these into two classes that we get by taking the total number of cows and the total number of oxen, it would leave about 25,000 three-year-old heifers. And it is fair to assume that every three-year-old heifer that is worth keeping is in milk, with the exception of a few in the beef breeds. But it is hardly fair to reckon these as full cows, and so I have called the two-year-olds of sufficient value to bring the three-year-olds to the value of cows. This gives us in round numbers 170,000 full producing animals. Of course a large number of these cows are the foster mothers of veal calves that are being raised, as in certain sections of the State this is becoming quite an industry; a number of them are employed in supplying private families; quite a number are used to supply the city milk trade; a large number are furnishing cream for sale, and again a large number are used for cheese making. The balance are used for butter making. The business of our dairying is especially, butter production; dairying, not for cheese making but for butter making. The number of cows employed in our creamery work is not far from 30,000, relying on the data furnished by the creamery men. This represents but a fraction of our total dairy work. But one cow in five or six is employed in this method of associated dairying. We are inclined to regard our creamery work as the great factor of our dairying, but you can readily see that it represents but a very small proportion of it. The milk of the other 140,000 cows is being disposed of in some other way.

We have 49 creameries in the State, but they are not all running. Some of them have been given up because they were started under unfavorable conditions, not because our dairying has not been prosperous and fairly profitable, but because the creameries were established in places where the cow population was sparse, where there were not cows enough to make a business that was not too expensive. A few have been abandoned, but the larger number have been absorbed bv the larger creameries. I have not received returns from all that ought to have made them, but I have quite a number. We have also 14 cheese factories. You know the history of our cheese making. When we began to make cheese, 30 years ago, cheese factories were erected in every county and in almost every township, in our State. To-day we have 14 in operation, and they have drawn in a larger amount of milk for cheese making than in previous years. The cheese has been manufactured and divided among the patrons and sent to market by each individual, or else the milk has been bought and paid for, or the money has been divided instead of the cheese. Cheese making has been a very satisfactory line of work. The greatest industry, the one that attracts the most attention and that is the most profitable, is our cream selling, because in our cream selling we have attained a reputation outside of our State. The use of sweet cream has been largely increased in recent years. Fifteen years ago we hardly knew anything about it. This year the output is one-third more than last year. We have sent out at least one half a million dollars worth of cream into our own city markets and the markets in other states. The creameries in the State have paid the farmers not far from one million dollars for cream or milk, which has been manufactured into butter or sweet cream. Half of that has been sent out to market in the form of cream. You can readily see that we are not a butter making State, so far as our creamery work is concerned. We have been very sore for years because we do not have any reputation for butter in Boston and in the large markets. We have a reputation for our cream and it is something of a satisfaction to us to know this, and to see the signs displayed, *"Maine Cream,"* in the cities and villages all over New England. We have a reputation there if nowhere else, and it is one we may be proud of. This industry has its place. The creamery men are getting the most out of it, and it is right they should. They are selling cream from $1.10 to $1.20 a gallon, that would produce 90 cents or $1.00 in the form of butter. This has left a large percentage of profit in the hands of the creamery managers. It has made a grand business for them. It has been a great inducement to them to extend their business. They have put a great deal of labor and thought into it, and they have been able to pay the farmer, because of the profit they were getting through cream selling, a more generous price than if they confined the work to mere butter making. We need not feel sore because we are not getting a large part of the money which comes from the sale of sweet cream. I should like for the farmer to have more of it, but I do not see how he is going to get it.

The cheese industry promises to be a source of considerable profit and of a great deal of importance to our dairy interests, whether it shall be the work of the cheese factory or of the private dairyman. A great many of our private dairymen are engaged in this work and quite a number are making cheese throughout the entire year. Of course the cheese that are made in our farm homes throughout the winter season are not cured much. They go to market as green cheese. They are sent at about three weeks old to our markets here and in the western part of the State, as the cheese are mostly made in the eastern and central part. I have in mind dairies where the returns have been $75 per cow in herds of 25 Shorthorns and Holsteins, that are adapted to that kind of work. I query whether we are not pursuing butter making a little more than we ought. We import cheese, and import that which is of very poor quality. We do not use much cheese because it is not good enough, but when we can make a good cheese and put it into the markets it will be consumed in enormous quantities, and this will give us a home market for our products. The new cheese is not of a high quality but people eat it because it is mild in flavor, and it is much more desirable than old cheese brought in from other states. Long curing cheese, better made cheese, would be worth more. We have been following our dairying with a line of cows adapted to butter dairying, and we should do this, but this tendency to engage in cheese making ought to be encouraged. The Shorthorns and Holsteins are admirably adapted to it, and they also serve the purpose of producing the large growing heifers that are just suited to the markets of Massachusetts, the deep milking cows. In cheese making of course the skim-milk would be diverted from calf feeding, but there are other ways



THOROUGHBRED JERSEY HEIFER.
Owned by Mr. S. E. Sinnott of Kennebunkport.

in which calves may be raised and our cheese industry is well worth the attention of our people situated at a distance from the creameries. The product goes to market very cheaply, and we believe that on large farms in the interior of the State this industry has much to recommend it.

I was at the Dairy Conference at New Hampshire yesterday, and it was very gratifying that the product exhibited there was of high quality, and I fear that our stock collected here may not score as high, and show as well for us, as that did for them. Their highest score was 99½ and the lowest was 88. The average of the whole was 94. There were 100 exhibits, scored by as good a judge as we have in New England. Mr. Gurler from Illinois was there too, and looked over the samples with him and acquiesced in the scoring. That work was done wholly by private dairies and creameries, the highest scoring butter being from the creameries, the next from the dairies, and the lowest from those creameries that are pursuing the cream gathering plan. The highest award given to butter made from collected cream was 94 points. The high awards, 94 to 99½, were given to butter made from separator cream. There, is a very strong lesson for us. Their conditions are not different from ours. By using separators in their work, taking the milk fresh from the cow, running it through those machines and separating the cream, and sending that cream to a central station or having the work done at the creamery itself, the butter was made from cream close down to the cow, and it received the highest awards, as by right it should. The samples that came from the creameries that are doing their work as we are largely doing it, by collecting the cream in carts that pass by the farmers' doors, every day or once or twice a week, did not score as high, the highest award being 94 points; quite a marked difference in the scores, and in the selling values. I think we have there one of the lessons of the year. We are doing our work largely by collecting the cream. We are using cream that is old and in this way are not making that fine quality of butter that we ought to make. The only way that I can see out of this is by associating together and working in unison, with some plan that shall apply to all the creameries, so as to improve the quality of all our butter. We must improve it if we would have a desirable standing in the markets where the products are sold. The association of the creameries may help to correct this difficulty. The Turner Center creamery has paid the farmers this year almost $440,000 for milk and cream. Their sales have been about $539,000. You see that one creamery is doing almost half of the entire creamery work of the State. This means an association of creameries. Of course the Turner Center creamery was large of itself, but it has absorbed a lot of smaller ones and has become a great enterprise. The larger returns, per cow, that I have received come from these large creameries, those that are doing a business of thirty or forty thousand dollars a year. The returns from certain creameries are very low. Less than $20 have been paid by two creameries this year as an average for each cow that contributed milk or cream. The other extreme is something over $60. The cause of this is mainly inefficient work at the creamery. It is not chargeable largely, to the farmer, although of course the farmers' methods are defective. But in order to conduct the business the creamery operators send their carts so infrequently that the cream is not in suitable condition, and an inferior quality of butter is made, and it has to sell for what it is worth in the wholesale markets or else they have to job it off. I am not charging it all to the creamery managers, because the farmers do not all have the right stock and pursue the right methods, but they are ready to pursue right methods as soon as their attention is turned to the matter. Just so long, however, as the creamery managers are so lax and loose in their methods, striving to increase the volume of their business and not striving to improve the quality of the product, just so long the slovenly farmer will take advantage of it, and put no conscience into his work, and we can never get ahead until we do put conscience into our work. We are close to the best markets and we ought to hold those markets, but there is no way that we can do it unless we make as good butter as is made in other sections. You know the West has driven us out of beef raising; and you know that in every institute, from Maine to Minnesota, this matter of dairying has been the matter under consideration for the last five years, and people are producing enormous quantities of butter and sending to those markets, and the only way to hold them is to make something a little better, and we can do it if we set ourselves to it, but we can never do it by pursuing the methods we are pursuing now. You may think it is not necessary for me to call your attention to this every year, but we are never going to get ahead very much until we get beyond this method of collecting cream.

The matter of associating our creameries, and having them work together so as to make a uniform quality of butter I believe to be of great importance. And I believe it to be within the easy reach of our Dairymen's Association to call together the dairymen and the creamery men, and have them associated together in such a way, and have such an understanding of their business, that they can act together and act understandingly. The creameries compete with each other, drive over each other's territory, and there is a vast amount of wasted time. They travel for miles and get but little cream. That is expensive. Each creamery does business according to its own ideas, there is no sympathy between the creamery men in the different towns, no unison of action. There is no attempt to make an article in one creamery of the same quality as that made in another, and so we are acting independently. This association should bring together our creamery men and have them consider these questions until they thoroughly understand them, and then agree that they will attempt to produce a butter that shall be uniform in every instance. It can be done, but it never will be done unless the best of stock comes in to the creameries at first, unless good, sweet cream comes into the hands of the butter maker. By having the creameries adopt a certain process of manufacture, using pasteurized cream and destroying the germs that may come in from certain localities, having a sterile stock to start with, and having some central supply station where cultures shall be made and furnished, and having cream that is uniform in its conditions, the butter maker will have little difficulty in making butter of high quality. He can readily control the color, the salt and the grain, and when we can have a quality of butter that is uniform it will have some chance of recognition in the markets.

There is another feature of the work that will be benefited by the association of our creameries, and that is the marketing. The small creameries in our State, and it is those small creameries from which our farmers are suffering, have but a small hold on the market. Their product is poor and they put it into a low priced market, and send it as soon as it is made. When these creameries can associate and a high quality of butter can be produced and sent to a central storehouse, a large cold storage place, located perhaps at Portland, this butter, made when the price is low, can be put into cold storage and held until the price advances, as it always does on good sound stock. Here is an opportunity to save to our farmers a vast amount of money. It is no use to say that we cannot do it. When we make the butter there will be no trouble in securing funds for a cold storage plant, and then we can hold the butter ourselves, or if we do not want to do that, the butter being uniform and of a high quality, the large dealers will be willing to buy it and hold it on their own account. This is a matter worth looking after, and which perhaps may be of some advantage in future years.

The work of our Dairymen's Association has been perhaps not quite as rapid or quite as satisfactory as we had reason to hope. I think that there has not been as much business put into our association since it was established, two years ago, as we ought to put into it, though I am not blaming anybody for this. We formed that association thinking we might bring our farmers and creamery men together. We have not succeeded in this, but it is the right thing to do. It has done a grand work in this,—it has opened a testing station. You know one of the great differences that existed between the farmer and the creamery men was that of testing the cream which the farmer furnished to the creamery manager, who did the weighing, the measuring and the testing. The work was wholly done by the creamery manager, the farmer had no voice in it. In many sections this was unsatisfactory. The farmers distrusted the creamery managers, and they had a right to, because it was all one-sided. My friends, we have trusted our work to other people too much. The farmers have not done as much of their weighing and measuring as they ought. They have allowed the buyer to do it. That was unsatisfactory, and we believed that if we established a testing station and put into that station a man competent to do the work, an honest man, it ought to call in the samples from all of the creameries in the State, to be tested by that disinterested man, who was skilled in the work. I am not going to find fault with the butter makers. Every one has put on to him more than he ought to do, and when it comes to the testing of milk and cream he regards that as an additional labor, one that it is not his duty to do. The other 29 days of the month he is engaged in butter making and milk handling, and when he comes to this work on the 30th day, he does not believe in it, he hurries through it and does not do it as he ought to do it, and the farmers have grown to distrust that work in many sections. That is the reason why the Dairymen's Association believed that the establishment of a testing station was legitimate work for them, and that is one of the best things that have been done in any state, because when the samples are tested by a disinterested man it removes much of the opportunity for error, and will give the farmer more confidence in the work of the creamery. That station was established in connection with the Turner Center creamery simply because we could do it there cheaper than anywhere else. A room was furnished entirely independent of the creamery. It has done the testing for that creamery, but none of the other creameries have sent samples to this station established by the Maine Dairymen's Association where fair, honest work could be done. When those managers have been approached they say that they can do it at home and it will not cost as much, and so the work has gone on. While I am not blaming the men for not sending their samples there, I do blame the farmers of Maine for not insisting that the samples be sent there and tested by the man who is above suspicion because he is removed from the creamery and removed from the farmer.

From contact with the farmers, and from the amount of correspondence that comes to our Station necessarily, from the farmers; and from our institute work, there is everything to show that there is an increasing interest this year, as there was last year, in this leading industry of dairying in Maine. We find some discouraged at the low prices or small yields from their cows, yet in those neighborhoods we find men interested in their work and thoroughly alive to it; talking and thinking about the matter of getting better cows, breeding better cows, and feeding them better, talking about the matter of silage as a cheap means of feeding animals. All the way along there is an evidence that we have never had a greater interest in this industry of ours than during the last year. We have never found so many new silos being constructed as this year, and the question of increasing the stock and the pastures of the farm is receiving attention. We find in every town, certain men who are thinking about these things and doing this work, and that is the way we are going to educate our farmers and get on to this higher plane. If some man in a neighborhood does fine work others are going to copy it, and I believe that is the shortest cut to educating the farmer.

What have we done in the way of dairy education this past year? We have at our institution an opportunity for educating men for dairying. We have a winter course in dairying, and of course our regular students have a long period of training and become specialists. Our short course, covering a period of six weeks, takes any man or woman that may choose to come there and study dairying. We do not expect to make them proficient in one term, but it accompanies their reading, and furnishes an opportunity for obtaining instruction in that line. This course has been established there, at a cost of about $4,000, for buildings and equipment. And yet during the nine years that it has been established we never have had in any one year, over 13 men to take that course, and sometimes as low as seven. What is the trouble? Our Prof. Jordan, down in New York, got $20,000 for a building enabling him to conduct researches along the line of butter and cheese making. Wisconsin wanted $60,000 for the construction of a building, and equipment, and the legislature gave it to them, and every winter from the time of its establishment until the present time the farmers have sent more than 200 of their boys to that institution to take training in the science of dairying. That showed that the farmers of that state believed in agriculture and believed in the business of dairying as a specialty. Why do we not do better? Simply because our people do not believe in agriculture as a leading industry. We are engaged in lumbering and manufacturing, and other men are being recognized as the factors that conduce to the prosperity of this State, and the farmers are standing back and being overshadowed by them. They do not believe in the industry and do not believe in themselves and do not send their sons to get the education. What we need is a belief in our business and a belief in ourselves. You know how it is in the West. The farmers are the people there. Here we are not the people. Go into a western town and you will find the farmers coming in and going out as though they owned the town. The firms that make the agricultural machinery, the stores and the banks are for their convenience. I went down to Nova Scotia this fall and met one of the fruit growers. It became known that a stranger was there who was interested in their agriculture, and a knot of men came into the hotel to meet me, headed by the president of the board of trade, the president of the bank and the cashier of the bank. I did not go as the representative of an institution, I went as a farmer, and those business men were so thoroughly interested that they came in there to meet a stranger and talk over their business. Every one of them had a farm to develop. They are getting for their dairy school what money they want, and are filling it with students, simply because the people believe in the business. I want to know how many years it will be before a farmer could come into this town and the president of the board of trade and the presidents of the banks would come in to welcome him. I tell you, we have not made enough of ourselves. What are we going to do about it? If the people will not come to our institution for dairy education we shall have to carry it to them. That is what the Board of Agriculture has been doing for years. These men, fifty, sixty and seventy years old, are thoroughly interested in this work of dairying, in increasing the stock carrying capacity of their farms, and are alive to those questions, and they cannot go to school. The Board of Agriculture, through its farmers institutes, is carrying this instruction to the people, and I want to assure you that it is welcome. This year we have had two or three special dairy meetings of two days each, where we had the cream and the milk. We cured the cream, curing one lot of it in each instance with a starter and one with the ordinary process, one pasteurized and the other unpasteurized. Fortunately the work came out just right, and we never have carried anything to the people in the way of instruction that was so valuable and carried the lesson home so forcibly. Our dairy interests need money put into this work to help out dairy instruction in this State, and I believe that the money should be furnished by the State. I would not have it expended through the Dairymen's Association, I would not have it expended through the Horticultural Society, but I believe the farmers of Maine should come up this winter and say, we want ten thousand dollars expended in institutes, in meetings that shall come into every neighborhood, and carry instruction to little audiences, and show them good work along all lines, and we shall accomplish something. We started out in 1880 with $1,400 for farmers' institutes, which has been increased to $3,500, and when the farmers of Maine will come to the legislature and say, here is a great industry that has returned to the State of Maine this year six million dollars, and we have our fruit industry and our cattle industry and our crop industry; we have a mighty industry of agriculture in the State, and we believe in it, and we believe in ourselves, and we demand that you furnish education to us so that we can do better work and be better men and provide better for our families and ourselves, I am just as sure as I am that I am talking to you that the legislature of Maine will give the people anything the people ask, within reason. Thirty-five hundred dollars is not enough to do this work along all the lines of agriculture. Let that fund be larger, and then let the money be expended by the State Board of Agriculture. Officer that board as you will, and make that board responsible for the economical expenditure of every dollar. I do not know what better we can do than this.

UTILIZING THE WASTE PRODUCTS OF THE DAIRY.

By J. A. ROBERTS, Norway.

Success on the farm does not come by leaps and bounds. It is the result of every day work, of skillful management, of making available all its resources.

Competition is keen; the price of products is low, compared with former years; quick communication and rapid and cheap transportation have brought the whole world to one market, so that the stern necessity exists upon the farm to-day, as it does in other lines of business, of lowering the cost of production and, to this end, of utilizing all the by-products, allowing nothing to go to waste.

Dairying is a leading industry to-day. Its direct products of butter, cheese and whole milk find their way into every home, forming an important and valuable portion of the food. They form an important part of the commerce of the country. But the by-products of the cow are valuable as well. Skim-milk, buttermilk and whey are valuable food in the raising of animals, especially when young, and this includes swine and poultry.

They all contain valuable fertilizing constituents. Milk seems a necessity for the calf. It should have whole milk for a few days, then a gradual change may be made to skim-milk. At least a portion of the fat taken out of the milk must be replaced. For this purpose flaxseed tea is useful. Use one-half teacup of flaxseed to one quart boiling water, cooking it 15 minutes or more until it becomes jelly-like. Use a spoonful at first and gradually increase. Milk should always be fed at the temperature of freshly drawn milk. In its early days the calf should not be fed too much skim-milk. Teach the calf to eat whole oats, I find nothing better. Then with plenty of good, early cut hay it will thrive. Many farmers feed skim-milk to their calves until they are a year old or even older. The quantity is gradually increased until a pailful or more a day is fed. Calves so fed reach maturity early and are considered more valuable on this account. The skim-milk forms a large part of the food all the way along and thereby more costly articles of food are saved.

IOWA STATION TESTS.

Calf raising with separator skim-milk has been studied by Curtiss. Milk from the College herd was fed immediately after it had passed through the separator, the temperature being from 85 to 90 degrees. The chief object of the experiments was to determine the best grain to feed in connection with skim-milk. Oil meal, oat meal and corn meal, with a little ground flaxseed additional, were used. In the first test the cost of feed per pound of gain was 2.8 cents; in the second test, 2.1 cents; in the third test, 2.2 cents. In the first test the nutritive ratio was 1 to 2.6; in the second test, 1 to 3.6; in the third test, 1 to 4. Curtiss says, "The results of all the investigations made at this station strongly indicate that it is not only unnecessary but poor economy and poor practice in feeding to use a highly nitrogenous product like oil meal in combination with separator skim-milk. The practice has neither logical reason nor scientific theory for its support."

Notice that oats produced the cheapest gain. In passing we may notice that experiments in Denmark showed that where gravity skim-milk made a gain of 1.5 pounds a day, separator skim-milk produced 1.43 pounds. The gravity skim-milk tested .60 per cent; the separator skim-milk, .14 per cent.

As for myself, I believe there is no more profitable way of using skim-milk and buttermilk than to feed them to swine. My plan is to keep two or three breeding sows, raising two litters annually from each one. They are kept on the farm waste, except for a few weeks at farrowing time. When four weeks old the pigs are put by themselves, 10 in a pen. They are fed warm skim-milk, sweet at first, as much as they will eat up clean. A handful or two of corn is thrown into the pen to make up in part for the fat that has been removed from the milk and also to induce them to work over the raw materials that have been put into the pens, making them into the very richest of manure. That is what we are after in all our work on the farm, more and richer manure. The manure pile is the farmer's bank, and he should make his deposits as large as possible against the day of drawing out. As the pigs grow larger we feed a small quantity of wheat-middlings. At four to six months of age we begin to use corn-meal, a little at first, and gradually increase it until the point is reached when they will eat no more. They are sold at six to eight months, when they are expected to weigh 250 to 300 pounds. They should be kept clean. The damp basement of a barn is an unfit place. It is unhealthy. The cow manure don't need them and it is a mighty poor place for them. Give them a good, dry, warm pen and they will pay you for it. Furnish them with an abundance of litter and they will add to your bank account. There is profit in pigs when fed and kept in this way. The cow yielding 5,000 pounds of skim-milk and buttermilk furnishes 145 pounds digestible protein and 300 pounds of digestible carbohydrates and fat. As a fertilizer it contains 25 pounds of nitrogen, 10 pounds phosphoric acid and nine and one-half pounds potash.

Prof. Henry, at the Wisconsin Station, conducted 19 trials, with 88 pigs of all ages, to determine the value of separator skim-milk when fed with corn meal. The proportion of milk to meal fed ranged from one to nine pounds of milk to one pound of meal. The average of all his experiments showed that 475 pounds of milk equalled 100 pounds of corn meal. Reckoning corn at 50 cents a bushel, the skim-milk would be worth 19 cents a hundred pounds. The cow yielding 5,000 pounds of skim-milk would produce an equivalent of 19 bushels of corn meal, and if the meal be worth 50 cents a bushel the skim-milk from such a cow would be worth $9.50. In my own practice I have always rated the skim-milk of each cow as worth from 8 to 12 dollars, to feed to pigs.

It may be stated that Scheren found that 1,613 pounds of sweet skim-milk made 100 pounds gain, while 1,545 pounds of sour skim-milk produced the same gain, showing the sour milk as being a little more valuable than the sweet. This experiment was with very young pigs.

Figuring from these experiments we find that one cow's milk of 5,000 pounds would produce 316 pounds of pork, which, at 5 cents, would yield $15.80. This shows that milk fed to young pigs is of considerable more value than when fed to those of large size.

Many farmers feed their skim-milk to chickens and hens and claim a large profit thereby.

The more of the food that the cow eats that is produced on the farm, the nearer to perfect success the farmer has reached.

To this end he should make use of all the manure the cow makes, both liquid and solid, and not a bit of it should be allowed to go to waste. Upon this point we cannot lay too much stress. And yet vast quantities of this valuable fertilizer are permitted to go to waste every year. A man might almost as well leave his pocketbook exposed to the elements as his manure heap. Why not?

FORMATION AND WORK OF THE MASSACHUSETTS DAIRY BUREAU.

By Geo. M. Whitaker, Boston.

Imagine a young man with a small dairy herd and no experience starting to build barns adapted to his needs. Then imagine him as the years go by, as he accumulates experience, as he is successful, and as his herd increases, enlarging his barns and changing them according to the suggestions of experience or the demands of his increased business. Finally he will have a set of buildings that will answer his purpose; but they will be entirely different from what they would have been could he have started in the beginning full fledged as to experience and capital. This illustrates, in a way, the condition of our dairy laws in Massachusetts. Away back in the early '80s legislation on dairy topics commenced, and there were enactments relative to the inspection of milk and requiring oleomargarine to be properly labelled. Since those days there has been much dairy legislation, something almost every winter, until we have very copious laws, which answer our purpose well, but which are not what they would be were we to begin new and draft a code of laws based on our present experience. In 1891 there was a feeling that a dairy commission would be an excellent thing. This started in two ways: First, out of an idea that the enforcement of the dairy laws would be more effective and efficient in the hands of their active friends; and second, from the feeling that it would be a good idea to have some State department specifically entrusted with promoting educational dairy work. But at that time Governor Russell occupied the executive chair, and during the campaign previous to his election he had taken very strong grounds against increasing the commissions in the State, claiming that we were governed too much by that kind of bodies. So he intimated to the friends of this measure that he would feel obliged to veto a bill of that kind should it be enacted and expressed a wish that we could secure what we wanted in some other way. He had also taken a strong position in favor of increasing the executive responsibility of the Board of Agriculture; so that, after a number of conferences between the governor and the friends of the dairy interests, a scheme was devised by which there should be an unpaid committee of the Board of Agriculture, appointed by the governor, to be known as a dairy bureau. Then, as every organization of this kind must have some one to supervise the details of the executive work, the law provided for an assistant to the secretary of the Board of Agriculture in the work of the dairy bureau. The title "Assistant to the Secretary of the Board of Agriculture" was both cumbersome and misleading, and so by usage this was gradually dropped and the title "Acting Executive Officer" was evolved, having the sanction of accuracy and custom but without legislative authority. Last winter the law was changed so that the officer in charge of the bureau work was given, on paper at least, a more dignified position by having some statutory recognition through an independent title and legislative definition of his duties. That officer is now known as the General Agent of the Dairy Bureau, and his duties as defined by statute are to assist the bureau and to oversee under its general direction the work entrusted to the bureau. The duties imposed upon the bureau by law are as follows: "It shall be the duty of the said bureau to investigate all dairy products and imitation dairy products bought or sold within the Commonwealth, to enforce all laws for the manufacture, transfer and sale of all dairy products and all imitation dairy products within the Commonwealth, with all powers needed for the same; to investigate all methods of butter and cheese making in cheese factories or creameries, and to disseminate such information as shall be of service in producing a more uniform dairy product of higher grade and of better quality." An annual appropriation of $8,200 is fixed by the statute, for the expenses of the bureau and the salary of the general agent. The bureau meets monthly to hear the report of the agent, to make suggestions, to direct the general policy of the work, and to issue any orders that may seem necessary. The Secretary of the Board of Agriculture attends these monthly meetings as the secretary of the bureau. The relations between the bureau and its general agent may be likened to those which exist between a well regulated school committee and a superintendent of schools.

The work of the bureau, as you have noticed, is of two kinds, educational and police. The educational work receives less attention than the other, because of the smallness of our appropriation. We have only $8,200 to expend for all purposes and it is very difficult to stretch the dollars so that they will go as far as we want to have them. Yet, in spite of that, we have done considerable educational work; dairy schools, State butter exhibitions and many dairy institutes have been held and a number of bulletins have been published. A year ago we made an inspection of the creameries of the State, and many single addresses at grange and other meetings have been delivered.

Massachusetts has an organization of the creameries of the state, and the association at one time was to attempt to secure a small appropriation to help its work. It seemed best to the agricultural leaders of the state that such an appropriation should not be made; for fear that it would establish a precedent in a wrong direction, and perhaps create a reaction against all agricultural appropriations, if every state organization representing some especial interest should go to the legislature for appropriations. But the creamery association was given to understand that the dairy bureau would co-operate with it in every possible way. We assisted it at one time by printing its Journal of Proceedings as a "Dairy Bureau Bulletin." At another time, when it had a butter exhibition we furnished the experts to do the scoring; and on other occasions we have furnished speakers for its meetings. So that the creamery association has had all of the benefit of a small appropriation without establishing the dangerous precedent of legislative appropriations to all voluntary agricultural organizations. So far as I know a friendly feeling exists between the members of that association and our bureau.

Since I have been connected with the work of the bureau I have made a specialty of collecting statistics and information relative to the Boston milk supply. Boston is one of the largest cities in this country,—fourth, by the latest census,—and its milk supply and the method of distribution is important. The various reports of the general agent of the bureau have contained maps of the sources of the Boston milk supply, and statistics of the supply from year to year and from month to month, making the file of reports a complete statistical record of the milk suppy of Boston. This is the first time that anything of that kind was ever tabulated or put into shape for permanent preservation. During the past year, our work has been pressing in other directions, so that our educational department has not received as much attention as in some previous years; yet during the year just coming to a close I have addressed 19 meetings, held a two-days institute in connection with the Springfield Milk Dealers' Association, and issued one bulletin.

Taking up the second division of the work of the bureau, the enforcement of the dairy laws, we will first consider the power given to the bureau. The statute says: "Said bureau, and such agents and counsel as they shall authorize for that purpose, shall have access, ingress and egress to and from all places of business, factories, buildings, carriages and cars used in the manufacture and sale of any dairy products or imitation dairy products, and shall have access to all vessels and cans used in such manufacture and sale. Whoever hinders, obstructs, or in any way interferes with an officer or duly authorized agent of the dairy bureau in the performance of his duty shall be punished by a fine of $100 for the first offence and $200 for each subsequent offence."

Next, what dairy laws do we have? As I said before, they are somewhat redundant and profuse, and would be changed considerably were we to establish a new code. They are in substance as follows: The oleomargarine laws of the State require the branding of all tubs and boxes used in the business, the marking of all wrapping paper used in the retail trade, the labelling of the exposed contents of tubs when the covers are removed, the placing of signs on wagons from which oleomargarine is sold, the posting of signs in stores where oleomargarine is sold, and the giving notice to guests in hotels or restaurants where oleo is served. Our laws also prohibit the sale of oleomargarine when butter is called for. But the most drastic of all legislation is our now somewhat famous anti-color law, which prohibits the selling, exposing for sale or having on hand with intent to sell, any imitation of yellow butter.

Massachusetts' milk law prohibits the adulteration of milk, and also the selling of milk not of standard quality. The law makes the standard 13 per cent of total solids during six months of the year and 12 per cent the other six months. Up to last winter the law treated alike the sale of adulterated milk and milk not of standard quality, but last year a milder penalty was provided for the sale of milk not of standard quality. The Supreme Court has decided that for the purposes of the enforcement of the milk law cream is to be considered milk, so that if we find a sample of cream adulterated with preservatives, for instance, we can maintain a case in court by charging the person with selling adulterated milk.

We have a law requiring filled cheese to be so labelled, and we also have a law requiring renovated butter to be labelled "Renovated butter."

In the enforcement of these laws the dairy bureau has concurrent jurisdiction with the Board of Health and local milk inspectors. The Board of Health having for years done much in enforcing the milk laws, and the dairy bureau having been organized at the time of the passage of the anti-color oleomargarine law, we leave to the Board of Health most of the milk work and occupy most of our efforts in enforcing the oleomargarine laws. In but few instances do the local milk inspectors do much. Of course the city of Boston is an exception. Most of the inspectors in the smaller places receive only a nominal salary—$100 to $200—and do not do much more than to issue the regular licenses to milk dealers.

The money at the disposal of the dairy bureau is sufficient to allow us to employ two regular inspectors and occasionally a special on some particular job, when an unfamiliar face seems to be needed. Our regular inspectors soon become known to the oleomargarine people, who make great effort to keep track of them. Frequently as soon as one reaches a town the dealers are notified by telephone. Sometimes even before he leaves the station in Boston a telegram goes ahead announcing that he is coming. Hence we are obliged to study all kinds of detectives' schemes and sometimes to employ some new person for a few weeks.

The duty of planning the work of these inspectors and receiving their reports devolves upon me. They go from place to place, calling upon dealers in dairy products, hotels and restaurants. In the latter places they order meals, like any regular guest. In the case of dealers they make purchases when they can, but they are so well known that usually the store or wagon is carefully examined, the stock of butter is inspected and samples taken. These inspectors wear a badge something like a policeman's badge. On going into a store they show this, and ask to be allowed to look over the stock of butter. If the dealer refuses to allow them to do so, it is an obstruction of their work, for which there is $100 fine. If he is doing a crooked business he can take either horn of the dilemma,—let the inspectors hunt through his place and find the evidence on which he will be fined, or pay the fine for obstructing them. These inspectors soon become so expert that they can tell oleomargarine readily, and take samples only when they find it; otherwise the expense for chemical work would be greatly increased. As they are able to detect oleomargarine by appearance and taste, we send to the chemists almost nothing that does not prove on analysis to be what we are suspicious it is. Some of the subterfuges of the oleomargarine dealers suggest the tactics of rumsellers, and are exceedingly interesting. I will mention one for purpose of illustration. One of our detectives went into a store in Worcester, and failed to find oleomargarine, though rumor had said that a great deal was sold at that place. Leaning against a barrel of beans to have a little chat with the proprietor, he found that it was not as firm as one would naturally expect from so heavy a commodity. He made a little investigation, and found that the barrel revolved on a pivot and that there were only four or five inches of beans, supported by a horizontal partition; below there was a large opening in the side of the barrel and inside the open space a tub of oleomargarine.

When a customer called, the barrel was revolved to disclose the open side, oleomargarine cut out of that tub, and the barrel whirled back to look like an honest barrel of beans.

Peddlers give us more trouble than any other class of law breakers. They have no established place of business. Their supplies are secreted frequently in cellars of private residences. They are constantly on the move and hence hard to locate; when we do find them it is sometimes difficult to get evidence against them, which will stand the technicalities of court practice. In one instance we got a tip that a certain peddler would reach a town in Norfolk County in the early part of the evening and would put up his team at a livery stable there. Our inspector was on hand bright and early the next morning in order to see the horse harnessed and the man start away, when he intended to get upon the wagon, a canopy-topped affair, and take some samples. It was necessary to see the man perform some act as owner or agent to establish his responsibility. But the owner saw the inspector and made up his mind not to be caught. So the proprietor of the wagon and the inspector sat in the stable office all day watching each other. Finally the inspector telephoned to me for instructions, reporting that the wagon had wooden doors behind, which were locked. I instructed the inspector to demand admission, and, if he were refused, to smash in. When he did so he found that not only had the State law been violated, but the United States law as well, for the revenue stamps had been scratched off. The inspector seized six ten-pound tubs which were delivered to the internal revenue officers. We managed to get evidence to convict the man in the state courts and then he had the United States Government to settle with. While much patience and shrewdness are often necessary to secure evidence against a person doing business in a store, especially if no stock is carried and only an order business done, the difficulties are much larger in the case of peddlers.

The getting of evidence of violations of the milk laws is similar to the procedure in the oleomargarine work, except that less detective skill is usually needed, the milk business being more open. In the matter of cream the same can be said, although we often buy a small bottle of cream, taking the whole to the chemist. We have never done any cheese work. So far as I can find out, filled cheese is unknown in our markets. Our renovated butter law is comparatively new, and all that we have done under it so far has been to issue warnings to dealers that they must have their wrapping paper marked, and also the tubs or boxes.

When the inspector takes a sample of oleomargarine or imitation butter, by purchase or otherwise, he fills a little box, and a memorandum of the essential facts in the case is written on a tag. A wire is put around the box and given a few turns through the tag, and the box sealed so that it would be impossible to open the box or to detach the tag from the box without breaking the seal. This box and tag are then delivered to the chemist, who analyzes the substance, noting the result on the tag, when it is sent to me. On receipt of the card from the chemist, the information on it is carefully studied to see if there is sufficient data on which to maintain a case in court. If more details are needed, the inspector is sent to supply the missing links. For instance, investigation as to the ownership of the store or the authority of an agent must be made. In the case of a peddler it is necessary that we should have such evidence as will make out a case of "intent to sell." Finding imitation butter in a store, with other merchandise and the paraphernalia of doing business, is *prima facie* evidence of intent to sell. But suppose we find a man driving around the town in an ordinary buggy, with a tub of oleo under the seat, there is in that fact alone no presumption of intent to sell and we have to go farther in pursuit of evidence.

When a case is properly worked up, a complaint is sworn out, on a general printed form supplied by the court. The specific allegation is printed on blanks which I furnish and which are attached to the complaint.

When these cases come up in the lower courts I appear and prosecute them. Although not a lawyer by profession, heads of departments prosecute in the district courts the cases in which they are interested. For a while we hired lawyers, but we soon found that a person who had studied thoroughly the dairy laws of the state, who was familiar with all of the court decisions bearing upon them, and who had had some court experience, could do just as well as a lawyer who might be very eminent in all-round ability but was lacking in that particular qualification. We find little difficulty in winning nine cases out of ten. If the cases are appealed to the superior court, the district attorney becomes the prosecuting officer, but it is my duty to furnish him the information required and the results of experience in other counties.

The method of trying a case is something like this: The inspector is sworn as a witness, and the tag above alluded to is given him. It is a principle of law that a witness can refresh his memory from any original memoranda made at the time of the event about which he has to testify. He states the facts given on the card, and if the defendant has a lawyer a more or less rigid cross examination may follow. Then the chemist testifies as to the result of the analysis. Once in a while we find a lawyer who wants to cross examine a chemist, but they are few and far between, and they never make anything out of it. Sometimes there is a quibbling issue raised over the color of pure butter when we allege the selling or intending to sell of imitation butter. In many cases there is no defence except what may be brought out by the cross examination of government witnesses. Sometimes, however, there will be hair-splitting law points and sometimes there is an attempt to discredit our inspector, for there is no story too big for an oleo dealer to tell. The whole gang is thoroughly dishonest, and our experience has included two perjury cases.

When an oleomargarine dealer is found to be a law-breaker he has usually violated four or five laws, we have so many. For instance, if he has sold oleomargarine for butter, he has sold imitation butter, he has usually sold it without making any mark on the wrapper, or without having any sign in the store. It is possible for seven laws to be violated in the case of one sale. But we cannot bring seven complaints. In bringing a case into court we have to conform to court practices, the wishes of judges, and on an appeal the judgment of district attorneys. So that in the enforcement of oleomargarine laws or liquor laws the efficiency of the work does not depend wholly upon the prosecuting officer, but is dependent to quite an extent upon the court practices and machinery. In our states judges do not like to entertain more than one case based upon a single transaction, so that if in one sale seven laws are violated we bring one case. Hence this multiplicity of offences does not avail us in piling up convictions.

Formerly it was my practice, when oleomargarine was sold as butter, to bring complaint under that law and allege that, for in that there is a moral offence as well as a technical one, and I felt that such a charge would appeal more strongly to judges and jurors. Experience showed me, however, that the dealers had the advantage in defending themselves against such a charge, for I was required to prove beyond a reasonable doubt that butter was ordered, while the slick dealer would say that he understood our inspector to ask for butterine, with a falling inflection on the last syllable, or he would have some similar equivocation or quibble. The same principle held true as regards the matter of signs. If we put a dealer into court for not having a proper sign in his store, he might bring in a sign all fly-specked and showing the marks of age, and swear that the sign had been there for months, and his book-keeper and clerks would confirm the story.

In milk work we usually allege that the defendant had in his possession, with intent to sell, milk not of standard quality. The usual adulterant of milk is water, but it is easier to prove that milk is not of standard quality than to prove that water has been added or that it has been partially skimmed. When we find preservatives or coloring matter we allege adulteration, and there is no trouble in proving it.

In one instance we lost a case through rather a remarkable ruling of the judge of the superior court. Our inspector went into a store and asked for cooking butter and was given oleomargarine. The judge said that if the word cooking was an adjective describing the butter the man should be found guilty, but if the phrase "cooking butter" was a trade name used to designate some particular substance, the man should be acquitted.

As a result of these experiences I have of late years brought all of our complaints, except in hotel cases, under the anti-color law. I simply charge the defendant with selling, or having in his possession with intent to sell, imitation of yellow butter. The inspector testifies that he took a sample of something that looked like butter, and the chemist testifies that he received from the inspector something which looked like butter, but which upon analysis was found to be something else. In cases of this kind we only have to prove the negative; we do not have to show what the substance was, but that it was not butter.

Although there is considerable difference of opinion among the judges and jurors in Massachusetts in regard to the merits of the anti-color law, this seldom seems to interfere with conviction. Last month we secured a conviction, with a fine of $500. This anti-color law has stood the test of our supreme court and the national supreme court, and has been copied by some twenty-five states. The issue before the United States supreme court was whether or not there is in our interplay of state and federal government enough interstate rights to allow states to regulate the sale of imitation products. Our attorney argued that if there is no such power commerce might be paralyzed, and that a long-suffering public would be never secure of protection against fraud as long as the article was sold under the fiction of an original package from another state. The supreme court took that view of the case.

This leads me to a suggestion which I would like to emphasize. I wish we could get into the habit of using the word "oleomargarine" less than we do and using the expression "imitation butter" more. Oleomargarine as such is primarily a mixture of tallow, lard and cottonseed oil, all of them wholesome food products and against which, as such, we are waging no warfare. But when the spirit of commercial greed colors this product, puts it in butter tubs, makes it into prints and calls it butterine, then the substance has departed from its inherent character and becomes a counterfeit. Then why not call it so? I am frequently asked if oleomargarine does not have food value, and I frequently have to explain that we are fighting a commercial fraud, which is sold dishonestly in most cases and at a profit of 60 to 100 per cent. How much better it would be to speak of "imitation butter." The trade is dropping the word "oleomargarine" for the deceptive word "butterine." Why should we not drop the word "oleomargarine" and adopt the expression "counterfeit butter," or "imitation butter"?

One word as to the result of our work in Massachusetts. The milk laws, and the way in which they are enforced, have been

DAIRY HERD OF JONATHAN BENN, HODGDON.

a great help to consumers and much benefit to producers. The best information as to the result of the imitation butter laws is furnished by a statement made to Congress last session by the commissioner of internal revenue. He stated that in Rhode Island, where there are no restrictive laws, the consumption of oleomargarine last year was a little over eight pounds per capita, while in Massachusetts it was only .73 of one pound. The law saves our consumers from a great tidal wave of deception and saves dealers in honest products from a flood of competitors.

J. W. TRUE.

I will only call attention to one or two points. The lecture by Mr. Whitaker to which you have listened has given us a very full idea of the Massachusetts law pertaining to dairy matters, and also of the workings of that law. It would seem that they have quite a good deal of work to do there in carrying it out. Every time the sale of oleomargarine is stopped it adds just so much to the amount of pure butter that the dairyman sells. I do not know to what extent imitation butter is sold in the State, but there must be more or less sold. Our failures will sometimes show us what might have been done, and we can draw lessons from them. For instance, take the matter of fruit this year. We failed to get the exact standing of the amount of fruit in the country and in the markets, and many people sold their fruit for a great deal less than it could have been marketed for just a little later in the season. Now this dairy interest, as we were shown this forenoon by Prof. Gowell, is immense, and should be fostered. There should be an increase not only in the product from each cow, but the price of the product. There should be an increase in both directions, and it seems to me that if we could have a dairy commissioner, if such an office could be created, or if we could have some person designated as such to assume the duties of this office and carry out the law in regard to the sale of spurious butter, it would be one of the best things that the dairymen could have. Perhaps the educational part had better be left to some other organization, as the Board of Agriculture, which is all in running order. Give them more money to work with, to instruct our dairymen in the methods of making butter and marketing it, and look after the dairymen who are furnishing cream to the factories. It seems to me that this would help in that direction. I think perhaps we would need some law resembling the Massachusetts law, or a portion of it. Perhaps Mr. Whitaker could give us some points as to what would be necessary in our situation. I hope we may bring something about that will help the general dairymen, in stopping the sales of spurious butter and enabling us to get more butter per cow and more per pound for that butter.

Ques. I would like to ask Mr. Whitaker if he has any means of knowing what the sales of oleomargarine are in his state.

Mr. WHITAKER—I think about two million pounds. The figures are given in the report furnished by the Internal Revenue Commissioner to Congress last winter. The laws in our state are defective in this,—that they do not prohibit the use of oleomargarine in public institutions. A great many of our alms houses, our soldiers' home in Chelsea, and other public institutions use oleomargarine. They send out of the state for it and buy it by the carload, and so no law is violated, although they do violate the spirit of the law in using it in that way. The figures given as the amount sold in our state include what our public institutions use, and also what is sold illegally, that the bureau is not able to suppress.

Ques. Do you know about how much the oleomargarine costs these public institutions?

Ans. The wholesale price to the dealers is in the neighborhood of from 12 to 13 cents a pound. If they sold it at the profit that can be made on butter it would get to the consumer at about 16 cents a pound; and if it were sold to the consumer at about 16 cents a pound it would carry out the claim of its friends that it was the poor man's butter, but I never found any that was sold at that price. We have found it sold as high as 25 cents. One year ago, when butter took that spurt and was selling as high as 35 cents, I found oleo sold as high as 28, so that the retailer was making a profit of from 60 to 100 per cent, and it is that exorbitant profit that induces so many people to enter the ranks of law violators.

Ques. Would a ten-cent tax prohibit the sale of oleomargarine?

Ans. That depends entirely upon the butter market. If butter gets up where it did last year it would not, if butter gets lower it would. Of course it puts just so much more expense into the article and will restrict its sale considerably because the temptation of excessive profits will not be there. There is one phase of the question that has interested me a good deal, and as Prof. Jordan is here I would like to hear what he would have to say on that particular point. A number of chemists, including Prof. Goessman and Prof. Johnson of Connecticut, have said things as to the food value of oleomargarine and its wholesomeness,—statements that I believe are absolutely true, but which I believe have been made from a purely abstract chemical or physiological standpoint, without assuming to express any opinion, one way or the other, as to the ordinary commercial oleomargarine sold fraudulently. Now we in New England know those two chemists as being absolutely honest, reliable, straightforward men, but some of the dairy publications in the West have been abusing them, calling them corn cure fakirs, and calling Prof. Goessman "Gasman," and I have attempted to defend them and have been somewhat criticized for it and charged with undue friendliness to the oleomargarine interest. It seems to me it is the case of the shield with the two sides. The abstract mixture of lard, tallow and cottonseed oil has a value, and our friends are exceedingly unwise in calling these chemists fakirs, etc. But I do think that such chemists speak a little unwisely in speaking from the abstract four walls of a laboratory. I would like to hear from Prof. Jordan, whom we all know as an honest and reliable man and a good chemist.

Dr. W. H. Jordan—I think there is no doubt, Mr. President, but that oleomargarine, properly made, and the great bulk of it I fancy is properly made, that is, healthfully made, is practically totally digestible. And the only point which I am willing to concede, and it is a very fine point, is that possibly the work of digestion is a little greater. Possibly in an exceedingly sensitive stomach, a stomach that rebels against pork and considerable fat, there would be more comfort and recognized ease of digestion in eating good cow butter. But when oleomargarine is properly made, that is the only point I am willing to concede against it as compared with cow butter in the nutritive value, that is, the energy value, or any other food value which it may properly contribute. I have tried to stoutly defend this proposition,—that it is not a question of food value, it is a question of defending a legitimate product against an illegitimate one, illegitimate under the guise in which it is sold. It is a question of ethics, pure and simple. It is a question of rights, not a question of food value, and our dairy friends have made some very serious mistakes in either ignorantly or wilfully charging against that product things which are not true of it. I am glad to know of Mr. Whitaker's position. It is always a mistake to place your feet on untruths, and an unsound basis, in order to defend yourself. The representatives of the oleomargarine interests have succeeded in befogging the minds of legislators who, I think, are sincere in their attempt to do right and to vote right, by introducing this question of food value. They say it is an injustice to an honest product. One of his closest political friends said of the leader of our House that he was honest in his position. He believed the bill was doing an injustice to a legitimate product. They had befogged his mind by putting forward food values, etc., when that is not the question. It is a question of defending the butter of the cow against an imitation product. That is the way I look at it, and I believe that Prof. Atwater, Prof. Johnson and Prof. Goessman have simply lived up to the instincts of an honest scientific mind, and have not allowed themselves, because of popular clamor, to accede to things which are not true.

Ques. Is there any trouble in finding preservatives in different foods?

Ans. My experience relates only to dairy products, and so far as milk and cream and butter are concerned we have no trouble in finding them if they are present. They are used to quite an extent, but I think that in our state the use of them is kept very well in hand. It is very easy for the chemist to detect them. The most dangerous preservative at present in the market is the various forms of formaldehyde. Freezine is one form under which it is sold and advertised in an extremely deceptive way. The advertisement states that the action of freezine is the same as the action of ice and that it is a substance that will kill bacteria or hold them in check, the same as ice, and that it will evaporate in a few days so that there is none of it left in the milk and the chemists cannot detect it. As a matter of fact chemists can detect it, and there is no trouble in finding it and in getting conviction when it is found.

Prof. WOODS—Once in a while we receive letters that would seem to indicate that there is more or less temptation for shippers of cream from this State into Massachusetts to use preservatives. I would like to have you state the result upon the Maine cream trade if that should be a general practice.

Mr. WHITAKER—There is a very strong feeling on the part of many in Massachusetts that Maine cream is doctored with preservatives, and when I tell them that I have been unable to find any and the Board of Health tells them that they have been unable to find any, they say, How is it that it keeps so long? While it may be that the creameries have some process of putting it up by which it will keep a long time, I have not found any preservatives yet, and I do not know that the Board of Health has. If it were found that this was the practice, it would be a very serious blow to the Maine cream trade in Massachusetts. My own impression is that it is not used at all, or used in extremely rare cases.

Mr. GURLER—I was much interested in what Dr. Jordan had to say to us, and in the main I agree with him. I fully believe that we must have an honest foundation to stand upon, to make a fight. I am willing to give the chemist all the credit that is due him, but there are some things we find out that the chemist cannot find out. While this discussion was going on it came to my mind that I have a few friends that cannot detect butterine when they are eating it, but their stomachs will detect it and cast it out. I have known one case of this kind to occur so frequently that all doubt of the facts is removed from my mind. The percentage of people that are so situated I think is quite limited, but it emphasizes the point that we should know what we are eating. We have a right to know what we are eating, and it is an outrage if we cannot know this.

THE NEXT STEP IN THE EDUCATION OF THE FARMER.

By Dr. W. H. Jordan.

It may be accepted as a truism that we must first produce a better man in order to produce a better farmer and that if our fields and dairies are to show evidences of more intelligent methods we must begin by cultivating their owners. More than this, we are never to forget that man himself is the object of first consideration, and that the farm is to serve him and not he the farm. It is for such reasons as these that we are intensely interested in the problems of education. How shall the work of the school and the college best meet the needs of agriculture for knowledge of a special kind and at the same time aid in conserving for us those intellectual and moral qualities which must be our defence against business and social disaster, is a question of the highest importance and is pertinent to this occasion.

I shall present two propositions for your consideration at this time. The first one, and certainly not a new one, is that public education should take account not only of what man is but of what man is to do.

I have little sympathy with the creed of the closet philosopher who holds that the culture of the mental powers fulfils the whole purpose of the classroom. Many of us who witness the hard and sometimes unequal struggle of the farmer with his environment are convinced that the schoolhouse should be to him and to his successors not only a refinement but a utility. Besides accomplishing other desired ends, it should so far as possible furnish fundamental knowledge of a special kind.

But without dwelling longer upon this proposition at this point, let us clear the ground for its further discussion by reviewing the conditions under which the agriculturist of to-day is carrying on his work, conditions which stand in sharp contrast with those prevailing when this old century was young. In the first place the farmer is asked to consider an agricultural creed based upon the facts of science. He is admonished on every hand that to doubt and defy this creed will bring upon him the retribution that falls to the lot of unprogressive men. He has presented to him a philosophy of farm practice of which the alpha and the omega are the deductions of the laboratory as to the sources of fertility and the avenues of waste, as to balanced rations and unbalanced, as to plant and insect pests and as to the whole round of means and methods. If he takes up his family paper, that curious compound of accurate and inaccurate information in agriculture, domestic science, politics and religion, he is confronted by scientific terms, extracts from station bulletins, articles from the pen of pseudo scientists who wrestle blindly but resolutely with the limitations of a little dangerous knowledge, discussions of new fertilizers and feeding stuffs and spraying liquids, in fact the farmer holds in his hands a modern newspaper adapted to modern times.

If the potato grower steps into the market place he is confronted by at least twenty best potato fertilizers each with a formidable statement of composition. The dairyman finds in the same place bags of commercial feeding stuffs with so much protein and so much fat marked on them as required by law. The market gardener and fruit grower have their attention called to fungicides and insecticides and numerous forms of apparatus for applying these. In the winter the farmer attends, or should attend, the farmers' institute, where he hears for the most part sound, common-sense doctrines clothed in a semi-scientific garb, with an occasional lapse, by way of contrast, from both common-sense and science. When the rural delivery postman stops at the door he leaves the station bulletin, on the pages of which is found useful information conveyed in a judicious mixture of scientific terms and the language of practice. In fact, our farmer is moving in an environment charged with new thought expressed in a new phraseology. Science has marched forth from her seclusion in the laboratories of the old world and has laid her invigorating and reforming hand upon the arts, agriculture not excepted. The facts and principles of science underlie much that the tiller of the soil is called upon to consider.

No one will disagree with the assertion, I am sure, that this enlargement of knowledge and methods will be available for use in proportion as it is complemented by an enlarged understanding on the part of the farmer. Just as there can be no sound without an ear to hear or sight without an eye to see, so there can be no appropriation of those facts and principles which are the fruits of study and investigation by those who are both deaf and blind intellectually. We are indifferent to that which we do not comprehend. Let me illustrate.

Several states have recently passed laws for the regulation of the sale of concentrated feeding stuffs. It is provided that no concentrated feeding stuff coming within the legal meaning of the term can be sold unless licensed and especially unless properly marked. The object of such laws is to make it possible for the farmer to know what he is buying and to protect him against fraudulent guarantees.

The efficiency of this legislation rests largely with the consumers of feeding stuffs. If they do not understand its force or are ignorant of its provisions so that they are willing to make their purchases without any reference to the information and the protection that are offered, their lack of intelligence nullifies in part the efforts of the State to defend their individual interests.

The experiment station and the farmers' institute bureau are beneficent institutions but they are of limited value to those members of our rural communities who have so little knowledge of first principles as to be unable to read and listen with an intelligent appreciation of the facts as presented in bulletins and from the platform.

The agricultural newspaper is not to be ignored as a source of information to our rural people, but it must be read with discrimination. To accept its teachings without close scrutiny of the basis upon which they rest would cause serious mistakes, and how shall the reader always discriminate unless he has some acquaintance with the fundamentals of agricultural science?

Even station bulletins, written by well informed and careful men, may be misinterpreted by one who has no adequate comprehension of the significance of such terms, for instance, as protein, carbohydrates, fats.

This brings us directly to the question, How shall farmers generally become properly educated for their calling? And I shall first reply, Their special education should begin with some

JERSEY COW, OWNED BY JONATHAN BENN, HODGDON.

systematic effort, applied to their early training. It is a mistake to suppose that if the fundamentals of correct thinking in agricultural science are neglected with the youth he will later in his busy years make good all deficiencies through the hit-or-miss opportunities offered by the station bulletin, institute teachings and similar agencies. A few may purchase books and methodically study with some definite purpose in view, but the majority will not do this. Moreover, it is with the young that we should seek to establish a respect for the laws of the material world and a confidence in the utility of science. We should seek to create what may be called a movement of thought which shall bring the individual into harmony with his intellectual and material environment.

When we come to consider the special means for agricultural education your minds doubtless will at once turn to the agricultural department of your State University. You naturally inquire, Have we not provided this college as a place where the future farmers of Maine may be given the special training which the times demand? You have, and I can wish nothing better for your State than that this institution shall be crowded beyond the full measure of its resources with those who seek to study science in its relation to agriculture.

But is it not time for us to readjust our views concerning the place the agricultural college is to fill in our educational system? When the Morrill act of 1862 was passed men had millennial visions of every farmer hanging a college diploma on the walls of his library which should be the explanation of unheard-of triumphs over the soil. But we might as well confess, what we should have known would be the case, that as a direct means of widely educating the rural people the agricultural college is necessarily not available.

First of all, consider the possibilities. President Harris would be at his wit's end, if there should go up to him next fall and ask for instruction all the young men of Maine who are ready to begin work on the farm. His class rooms, his teachers and his resources would be utterly inadequate to meet such a demand. I venture the assertion that no land grant college exists in this country that has sent out an average of one agricultural graduate for each township in its state.

There are other reasons besides the limitations of space and means why not only young men who expect to be farmers do not seek the agricultural college, but especially why many New England farm bred boys turn to some other than their father's calling, reasons that are not a just cause of reproach to the boys or the farm or the college.

Those on the one hand who jeer at the college because it has no more agricultural students and on the other hand who reproach farmers and their families because so many country lads seek some other life work than agriculture, are either consumed in their reason by sentiment or prejudice or are shallow in their analysis of the situation.

Our land grant colleges have accomplished a grand work for agriculture and our rural people by educating leaders, disseminating information and promoting investigation. They have directly and indirectly brought into existence a new literature for the farmer and have aided powerfully in creating confidence in science as a utility. It is time, nevertheless, to openly and frankly acknowledge the fact that notwithstanding their great usefulness these institutions will be the direct means of educating only a small minority of the farmers of any state.

But what about the great majority? Three facts claim our attention in this connection: (1) the farmer sustains intimate and practical relations with the laws and forces of the material world; (2) We are in possession of a fund of knowledge concerning these laws and forces, very incomplete to be sure, but sufficiently definite and extensive to be useful, and (3) much the larger part of the young men who become farmers are to all intents and purposes ignorant of even the simplest principles of what we speak of as agricultural science. This situation is persistently and insistently coming up before us for consideration and the question which presses for answer and which should lie heavily on the conscience of those who determine the educational policy of the State is, How shall it be met?

And the conclusion first to be stated is that the proper education of the rural people must be accomplished by some widespread instructional effort,—an effort that shall reach every country school, every grammar school, every high school and every academy to which the sons and daughters of the farm have access. It must be an effort, too, that has behind it the sanction of law and the force of organization. To this matter the leaders in pedagogical thought and the officials of our State departments of public school instruction must give serious attention, not to hide behind the difficulties and dogmatically declare that we are doing as well as we can and that the old is good enough, but to devise means and methods for bringing the subjects to be taught and the equipment of the teacher into line with the knowledge and conditions of to-day. Just here we are met by several objections.

We are told that the present curriculum of studies is already overcrowded and that fewer rather than more subjects should be considered. Probably this view is correct. It is useless to expect the public schools to find a place for all branches of learning. All that can be done is to select for those young people whose school education will end with the high school or academy, or possibly at a lower point, the subjects most important to the common affairs of life. It is generally conceded that every child should be taught to correctly speak, read and write his mother language, to master numbers so far as necessary for ordinary business, to know the simple facts of geography and only the simple ones, and to understand the fundamentals of government and the essential duties of citizenship. Beyond this the studies should be those which best fit the person to comprehend and control his environment. Can there be any doubt as to what these are for the rural people?

Are not the intricacies of the soil more important than those of advanced mathematics? Will aptness in grammatical analysis make up for an insight into the wonders of plant life? Is the ability to draw an accurate map of one's own state more important than some knowledge of the position of the organs of the animal body and their function? While the facts of man's history are useful and inspiring, does not the farmer also need to know the life history of the species of plants and insects that are either beneficial or injurious? There is culture and refinement in becoming familiar with the great thoughts of literature, but shall the farmer gain a greater uplift of mind and heart and a greater blessing in his lifework, from these than from the thoughts of the Creator as read from Nature's page?

Doubtless those who magnify the utilitarian side of school training will be accused of catering to the commercial spirit of the present time and of degrading education to the dollar standard. It is unfair to so characterize the study of science. To be sure science is useful and why should it not be? Men must live and it is better and easier to live in harmony with law. Besides, study with utilitarian ends in view may also lend itself to mental culture and refinement of thought.

But right here comes another objection. We are told that the present most prominent subjects of study are the ones best adapted to the development of the intellect,—that no such efficient pedagogical instruments can be substituted for them. It is also impressed upon us that the chief end to be accomplished is the training of the mind. But our intellectual salvation does not rest with a few out of the many departments of knowledge which are important. Any dignified subject, organized into logical relations and severely pursued may be the means of intellectual culture. Language and numbers are not our only resource for mental training. Rightly presented the complex problems of chemistry, or of physics, and the wonderful lessons of biology have in them great training value.

No man is wise enough to divide the field of human knowledge into the useful and the useless for intellectual culture. On what tables of stone has the Almighty written the commandments of education that they may not be changed, and where are the prophets who have stood on the Mount of Inspiration and delivered these fiats of omniscience to the people! Let us be rid of the nonsense that as man's range of thought widens and his relations to the material world and to society change he must cling to the same old subjects as a means of mental development. I more than half suspect that the church is not alone in harboring dogmatism and professionalism.

It was not long ago that the department of public instruction in a great state turned a cold shoulder towards a university effort to promote the study of rural science. It is a department which holds in its grip the school experience of thousands of children and by its mechanical and inelastic system and its examinations which are the terror of sensitive young minds is in danger of defrauding the intellect and draining the vital power of the coming generation. The orthodox brethren of our schools sometimes are as reluctant to recognize new thought as are certain portions of the Presbyterian church to discard those statements of creed which few believe.

We are told that there are no textbooks for use in teaching rural science and that these are essential. The answer to this is, that when the commercial opportunity for such books arrives or is ever seen in the distance, they will be forthcoming. There are within my circle of acquaintances several men entirely competent to write primers on the soil, the plant, the animal, bacteriology, insects, milk and its products, and so on, and I feel sure that publishing houses would render greater service to this day and generation by employing these or other persons to write new school books on new and living subjects rather than to continue to unnecessarily multiply ways of presenting old subjects.

It is also asserted that the teachers of our country schools are not fitted to teach rural science. Many of them are not, perhaps, and they never will be until such teaching is required. One of our wise men remarked to me not long since, "The only way to do a thing is to do it." I see no reason why a demand for such service might not develop teachers for our high schools and academies at least, who would be competent to instruct in the simpler facts of science in their relation to agriculture and the home. Such instruction would be useful in every calling, from the farmer to the lawyer.

If there is a school official in this audience I can imagine him saying, "These views are all very good as a theory, but the speaker does not appreciate some of the practical difficulties in the way of reorganizing public school instruction. He has not had actual experience with untrained teachers, lack of proper text-books, insufficient funds and extreme conservatism. He is like so many who advocate reform, he condemns what exists without offering something better which it is practical to adopt as a substitute."

I am well aware of these obstacles to progress. I am convinced, however, that a beginning can be made in providing school instruction better adapted to the needs of our rural people.

In 1876 I was a teacher of a high school in one of the country villages of Maine. During the winter term there were among the pupils several young men who were a problem to me. They had "ciphered" and studied maps and dissected the English sentence until they were tired of it all. The problem was, What shall be done to profitably employ the time of these restless minds? I solved it in this way: I sent for a dozen copies of Nordhoff's Letters to Young Americans and once a day those big boys and I talked over some of the problems relating to political economy and citizenship, crudely to be sure, but without doubt profitably.

There was in the same school a class of very bright young ladies,—objects of special regard on the part of the young college graduate, you cannot doubt. This class gave its chief attention to the Æneid, Algebra, Geometry and Rhetoric, and there was keen enjoyment for both teacher and pupils in the exercise of the intellect which these studies demanded. Unless I am misinformed, no member of this class subsequently pursued a course of study at an academy or college. All the school training these pupils received as a preparation for being wives, home-makers and mothers was that furnished in this high school, and what was true in this instance is true of hundreds of others. We are all convinced, I am sure, that if physiology sensibly taught, plant life, the chemistry and function of foods, domestic bacteriology and hygiene, the ethics of society and similar subjects had engaged the attention of these young women, their intellectual development and refinement of thought would have suffered no deprivations and their understanding of the duties and responsibilities of life would have been much broader.

There is in the state of New York an academy located in the midst of a rural people which is patronized almost wholly by country boys and girls. Its endowment has been derived largely from contributions made by farmers. Not long since, the principal of this school called upon me with this question: "Is it practicable to introduce into my school the study of science in its relations to rural affairs?" It at once occurred to me, Here is an opportunity for the state through some medium or other to make an experiment to determine whether the subjects of modern thought and utility may be made the subjects of modern education. I wish that an object lesson of this kind might be presented not only to the people of New York but to you in Maine, and I believe that your State university would find no more profitable opportunity for extension teaching than to undertake the guidance and to some extent the equipment of such an educational effort in some one of the more promising high schools or academies. Somewhere and somehow a beginning must be made and one illustration of successful and popular instruction along the lines which have been indicated would arouse sentiment and be a powerful stimulant towards procuring the organization and means for extending similar courses of study to all the high schools and academies at which country boys and girls seek an education.

I believe that if the attention of the young people could be occupied with subjects of living interest we would hear less complaint of the boys breaking away from school at the earliest possible age. It seems as if the managers of many high schools and academies take more pride in building up efficient college preparatory courses for the few than in meeting the needs of the many. Six lads well fitted for college is a worthy result, but sixty young minds better prepared to meet life intelligently on the farm or in any calling would be a more convincing demonstration of the utility of school education.

The next step, then, which I would see taken in education is a fuller recognition in the schools of those branches of learning through which we come to a larger understanding of ourselves and of the world of matter and force.

My second proposition is that our school instruction should lend itself, so far as possible, to the upbuilding of right standards of morals in our business and social life. What has been said to you concerning the better equipment of the farmer for his special work is in the direction of enabling him to be a larger and more efficient producer of the commodities which the world needs. But if we are to produce we must sell, and if we are to maintain ourselves in the great markets we must have the confidence of those who buy. How shall we secure and retain this confidence unless an integrity of thought and purpose is manifested in all our commercial relations? It is for this reason if for no higher one that we need to carefully consider whether in our educational efforts in the home and in the school we are doing all we can to implant in the minds of the young the correct principles of business and social ethics.

But there is a larger reason for moral culture than mere commercial advantage. It is a false view of life which regards learning and riches as matters of first importance. If we decide that wealth and intellectuality constitute the highest standards of excellence, the chief requirements for true success, we reason falsely and ignore the plain teachings of all human experience. Vastly more important are the convictions, the sentiments and the ideals of men and women. The measuring rod by which the upright historian gauges a nation's real greatness is not its hoarded gold or its stores of knowledge, but is rather the altitude of its moral standards. This is in accord with our common judgments. Our confidence is neither in riches nor in learning but it rests confidingly in moral integrity. The philosopher also recognizes that in the last analysis, the defeats of a state, of a community or of an individual are moral defeats. The disasters that have come to this nation and to this commonwealth, whether in commercial affairs, in politics or in social conditions, can be traced ultimately to a departure from the principles of sound ethics. Somewhere in the chain of events selfishness, lust, love of gain or unscrupulous ambitions have darkened the understanding, weakened the moral purpose and caused ultimate failure. This is a great and central fact and one to which we should give earnest heed.

It may appear to some that these remarks are out of place as addressed to agriculturists. The belief seems to have been somewhat prevalent that truth, justice and righteousness have set up their permanent kingdom among our rural people. John Burroughs pays a cheering tribute to country life when he declares that "a nation always begins to rot first in its great cities, is indeed perhaps always rotting there and is saved only by the antiseptic virtues of fresh supplies of country blood." Who shall deny that the green fields, the leafy forest, and the running brook are health giving to the moral nature, and who shall not confess that from the day of the Puritan "embattled farmers" even until now the democratic ideals of this new nation have found anchorage and defense among the common people of the farms. But let us not shut our eyes to plain facts. Conditions have wonderfully changed. The country and the city are now near neighbors. Time and space no longer insulate the farm home against the influences of the city street. Rural life has lost its simplicity and has to some extent accepted false business and social ideals.

I greatly fear that the antiseptic moral energy of the country may sometime be fully needed for the purification of its own rotten places, if such is not the case now. There are already those who openly declare that the farmer is no longer a chosen instrument for the saving of the nation, but that to-day he manifests in his business and civic relations his full share of the faults and weaknesses that are our common menace.

I am in accord, then, with the opinions of thoughtful men when I assert that the twentieth century agriculturist will have vastly less to fear from poverty and ignorance than from a vitiated moral purpose. The secular spirit, unsound business practices, dangerous political methods and unworthy social ideals will surely be found within his borders and will constitute the underlying causes of his failures, whether as a business man or as a citizen. This farmer will need, therefore, to sit in the same school with his city brother and learn from the records of human experience what are the conditions and forces which make for the weal or woe of human society. His business and moral welfare will not require sociological conditions unlike those demanded by other classes of men, nor will he be amenable to peculiar laws of development. In the truths he should accept and in the ideals he should hold he must share the common need of humanity. Whatever harmful influences, or unsound doctrines or dangerous tendencies are abroad in our land should have for him no less interest than for any other citizen.

A Scotch writer who has endeared himself to all readers of his books has recently told us in the spirit of love and kindness that there is a shadow resting upon American life, the shadow of a dominating secular spirit, a materialism that is clearly seen by this old world thinker and of which we ourselves are not unaware. This shadow darkens our perceptions of right, clouds our vision of duty and must be regarded as the primary source of much that we deplore in our business and social conditions. Do not think that I am given over to pessimistic forebodings if I bring before you facts which are open to all observing minds and which must convince us that we are giving "an undue place to the value and influence of wealth." This is seen first of all in the conversation of the street and of the hotel office. The movements of the markets and of the stock exchange and the commercial effect of the latest political changes are the absorbing topics.

There appears to be a feverish anxiety to amass wealth, not as a means to higher ends but as an end in itself. Throughout the whole range of human activity from the highest to the lowest there is a disposition to inquire "How many dollars can I earn" rather than "How useful may I be." Even the halls of learning have become infected with the money getting spirit and young men are asking what is the dollar value of education. This should not be so. Every man lives on a low plane who has no higher purpose in the choice and pursuit of a calling than the mere acquisition of wealth. As our European friend well says, "Every calling in life should have its ideal, so that a man may work, not for what he has to get but what he is to do; and if he be a true workman, his final reward will be found not in what he has got but in what he has done." Surely not until our sons and daughters learn that the law of success is the law of service will they view the work of life from the right standpoint.

This pervading secular spirit finds expression in many ways in our political and business affairs. You cannot have failed to notice that nearly all the recent hard fought battles in legislative halls center around trade interests and that moral issues remain largely in the background. The great political contests of recent years have been waged under banners on which have been inscribed tariff and free trade, gold and silver. This has not been so because there have existed no pressing moral issues but because this secularism has invaded caucus and convention and forced itself to the front. To be sure there have been days of brightness when our citizenship has rallied to the support of justice and righteousness, for have we not stayed the hand of the oppressor and have we not promptly defended the sanctity of the American home? But we turn from these encouragements to face the stern facts of organized plunder in our great municipalities, of the unscrupulous speculative mania that has so many times prostrated our business life, of the corporate greed that has so often laid its masterful hand upon legislation and of the advocacy of "imperialism" from the low motive of increased trade, and we confess in humiliation that these things exist either because the people desire them or are indifferent to their significance.

So far I have been making allusions of a general character, which is the most comfortable way of discussing uncomfortable questions. The shaft aimed at no concrete example of evil is easily parried. It is when the corrupting domination of this overgrown secular spirit is illustrated by particular examples that we see clearly how far we have departed from our boasted moral standards and a defense becomes difficult.

Probably the most widely disseminated example of untruthfulness in the interests of trade is the advertisements which help fill our papers and magazines. What proportion of them is accepted as strictly accurate statements of facts? You will surely agree with me that it is not large. Is not this a most significant indication of a widespread dullness of the moral sense possessed by those who manufacture the necessities and luxuries of life? I do not refer alone to the patent medicine trade and other commercial efforts of that ilk where we have come to expect gross and transparent lying. In many directions we find grades of misrepresentation varying from slight exaggeration to a distortion of facts which is little else than a violation of the ninth commandment. Promoters of certain commercial articles juggle with the facts of science, telling half truths and misapplying the truths that are stated, to say nothing of actual falsehoods. If these deceptions were practiced only with reference to those commodities which are the non-essentials of human living, the case would not be so bad, but our foods and even our medicines are the subjects of wilfully false claims.

This is forcibly illustrated by the facts contained in a bulletin lately issued by the Maine Experiment Station on the composition and cost of cereal breakfast foods. One of these foods to which the bulletin gives attention is Grape Nuts, a preparation widely used and which the makers state is "made by special treatment of the entire wheat and barley." The claims for this food are most remarkable. One is that "the system will absorb a greater amount of nourishment from one pound of Grape Nuts than from ten pounds of meat, wheat, oats or bread." In the face of this assertion the fact is that one pound of wheat flour or one pound of rolled oats will furnish practically the same nutrition as an equal quantity of Grape Nuts. Another claim is that "four heaping teaspoons of Grape Nuts are sufficient for the average meal" when ten times as much is what a man at moderate work would ordinarily require.

The same bulletin notices certain gluten preparations which are often prescribed by physicians for diabetic patients. The value of these gluten foods for such a use lies in the fact of a very high proportion of nitrogenous material and a low proportion of carbohydrates. Three of these materials commonly prescribed were found to be no more nitrogenous than wheat flour, whereas they should have contained at least twice as much protein. In this instance the offense is not against the pocketbook and stomach of a healthy consumer as is the case with Grape Nuts, but the life of physicians' patients may be jeopardized by claims no less than criminally false.

These cases are mentioned as typical instances of dishonest advertising practices which are widespread. The inspiring motive is to sell goods rather than to accomplish worthy deeds or build up a solid business reputation. Facts are flung to the winds, truth is ignored and all considerations of business honor are sacrificed in an attempt too often successful, to deceive the public.

Then there are business practices where silence and not advertising is most fitting. I refer to food adulteration. What can more emphatically proclaim a blunted moral sense than the surreptitious introduction into our foods sometimes of substances which cheapen and sometimes of antiseptics which are a menace to human health. What is dearer to us than our physical well being, and yet scores of so-called American business men, for the love of gain, do not hesitate to contaminate our diet with inferior and possibly dangerous compounds. These are not men from the slums, whom good society ostracises, but who sit in high places at the social board, whose horses and whose footmen are the admiration and envy of a foolish but sometimes honest common people.

The work done by the Connecticut Experiment Station in 1897 and 1898 is convincing proof that food adulteration is no myth. Two thousand two hundred and forty-four samples of materials were examined, 424 of which were adulterated and 123 contained borax, salicylic acid and other preservatives. There is found glucose syrup in molasses, starch, glucose and coal tar dyes in our jellies, pyroligneous acid in our cider vinegar, grains and chicory in our coffees, cereal grains, ground cocoanut shells and tumeric coloring in our spices, cottonseed oil in our olive oil, animal fats in our butter and preservative compounds in our cream, sausages, codfish, oysters, catsup, preserves, jellies and other foods. In most cases these adulterated foods are sold for pure articles and the labels utter a falsehood.

When charged with these things the rotund and complacent business man tells you that you are old-fashioned, that these deceptions deceive no one, that "everybody does it" and that it is necessary to fall in with the common custom if any business is done. What a Juggernaut this creature business is, for it grinds under its deadly car the commercial honor of a people. Has a lie a higher market value than the truth? Then the lie we must use. When New York cheese is the standard, all cheese must hail from New York, even if the brand be stolen. When Vermont butter had a higher reputation than Maine butter, then no Maine butter appeared in the Boston market. Sardines packed by the French established a reputation in the markets of the world and now those packed on the coast of Maine have a French label. Olives are grown on plum trees and French peas are produced on American vines. The brand, the name, the label, which has the highest commercial value is used whether true or false. This is business and business must be "pushed" no matter what the effect upon our moral well being. Shrewdness and sharp methods are exalted and open, square methods of dealing are cast down.

Occasionally this situation is made clear as with a lightning flash. Not long ago one of our prominent operators in the business world was called before a congressional committee and when asked if he thought that certain practices of the great business combination of which he was the representative were in accordance with sound business ethics, he was reported to have answered, "I don't care two cents for your business ethics."

But why say more? Perhaps you will ask, Why say so much when talking to farmers? Because these things are a part of the farmer's environment, because it is into the business world where these practices exist that the farmer's children will go, because the same spirit which is potent in the great market places infects the country village, and because in the remedies which may be applied the farmer has the same responsibilities as other citizens.

Let us look a little more closely, too, and see whether the secular spirit and its results are not found in the ranks of agriculture. To me this spirit is manifested in the unwise economy and intense thriftiness which dwarfs the best life of so many farm homes, where adornment, good reading and healthful recreation are classed as vanities, where the farm dominates the farmer, where a day is lost if it is not filled with hard work, and where the fireside conversation is of getting and saving. Moreover, have we forgotten the experiences of our creameries and cheese factories in buying milk and do we not remember how we lost our foreign cheese trade? Must we ask our fruit exporters to again expose to our vision the middle of a barrel of apples? I wish the president of the Eastern New York Horticultural Society could repeat to you the words of an English fruit seller who addressed this society at a late meeting. It has been stated to me that this foreign trader reported our American fruit as having a hard name in the English markets because dishonestly packed, a statement which is in harmony with facts as known by New York shippers.

But I will desist. Already I feel like apologizing to you for such a display of the worst side of our business methods, especially when there is so much in American commercial life of which we may well be proud. But how shall we become aroused to the dangerous tendencies which beset us unless we occasionally strip bare the motives and practices which disgrace our commercial life, unless in all its ugly nakedness we behold the corruption of our business morals?

But what shall we do? Where lies the remedy? Not in any one influence or effort, certainly. More than this, it is useless to expect that our business or social creeds will be reformed suddenly. The modes of action of a people are slowly developed and as slowly modified. The moral standards to which we conform, like systems of public education or like the formulas of the church, are not struck into existence by a single blow, but are built through a process of growth. We must look then to those constructive forces which in the home, in school education, and in social relations are active and potent in the formation of character; for we must never forget that the attributes of a people are simply the resultants of individual units of sentiment and conviction.

I ask your indulgence, therefore, while I bring to your attention as my concluding topic the relation of the school to our business and social welfare. This factor in education stands next to the home in the demands which it makes upon the time and attention of our young people. From the day when the child enters the schoolroom until he graduates from the high school, nearly one-fourth of his waking hours are spent under tuition in the branches which are accepted as essential. This instruction is very properly regarded as of prime importance. Parents make great sacrifices in order that their children may receive all the educational advantages provided by the State. We of this nation boast that every child in its borders has furnished to him at public expense the fundamentals of a liberal education. We fervidly exalt the little red schoolhouse as the conserver of our democratic ideals and liberties. We point with pride to the fact that from this temple of learning, though sometimes built of logs and exceedingly humble, have gone forth statesmen, lawgivers and poets. This is well. No one would see this institution cast down from the high pinnacle where we have placed it.

But on the other hand, I am inclined to question whether our public schools are doing for us what we seem to think they are, and I am skeptical as to their present value in helping to maintain high political and social ideas. The moral value of a mere acquaintance with a certain range of facts is not evident. It is quite probable that the boy who knows much about numbers or grammar or geography, will consent to lie or cheat or steal as quickly as the lad who is more ignorant of these subjects. The rules of arithmetic or the science of language carry with them no hint of moral obligation, and while the child who becomes familiar with these branches is made mentally stronger, he is not necessarily more keenly alive to distinctions of right and wrong.

There is a wide difference between intellectual development and moral culture; and with this fact staring us in the face we have vastly more to fear on the part of our citizenship from a lack of loyal discrimination in matters of obligation and duty than from ignorance or from mental crudeness. We are justified, I believe, in asking whether this endless mechanical drill in the traditional subjects of the school curriculum, followed by examinations which are largely severe tests of memory, is accomplishing for individual and social character what should be demanded. If moral fiber is needed in upholding the essential framework of the political and social institutions of civilization, is it unreasonable to expect that so costly and absorbing an effort as our public instruction shall contribute to its formation?

How can this end be secured? This is an exceedingly difficult question to answer. There is one fact, however, that is well worth our consideration, which is the extreme secularization of our schools. The Roman Catholic declares that our schools are Godless, and if this means that they are divorced from sectarian teachings such criticism is the loudest praise. But is there not a germ of truth in the Catholic's assertion? In our anxiety to free our skirts from even a taint of the union of church and state, have we not passed to a dangerous extreme in excluding all consideration of moral relations? The fundamental principles of ethics are not out of place in a course of study, for the obligations of the individual to his neighbor, to government and to society are not exceeded in importance by any subject whatever. In fact all teaching should be directed toward the cultivation of high thought and purpose. He who instructs in science and who does not cause his pupils to gain an abiding faith in the eternal verities has failed in his privilege and duty. History should be to the learner something more than a succession of events, for out of it the young mind should read the inevitable triumph of right and the certain defeat of wrong. Literature should cultivate fine sentiment and civic patriotism, so that the eyes shall fill with tears and the heart swell with indignation at the story of wrong and oppression.

The child should be made to see in nature's wonderful resources not an opportunity to satisfy greed but her beauty, and her method should speak to him of beneficent purpose and of high destiny.

We should have a care lest this secular spirit that is abroad shall seize upon the school and wither the fresh foliage of our civilization and dry up the fountains of our noblest aspirations. To this end our teachers must be something more than professional experts. The standards by which we test their fitness to give sound education should include more than a mere knowledge of facts or an acquaintance with the latest pedagogical technics. These instructors should see in every young mind a responsive and fertile soil where may be sown the seeds of truth, high sentiment and moral purpose, each to spring up and fruit after its kind. They should strive to build into the body of our citizenship the enduring and invincible fiber of truth, justice and patriotism. To do this is a high and responsible office and it should have its adequate reward of wages and of honor. Has the state thousands to spend on its commercial enterprises? Then it should place millions at the service of its children who are to be the fathers and mothers and citizens of the coming century.

Emerson once wrote that "in every age of the world there has been a leading nation." It may be that in the providence of God this nation is to enter into the honor and responsibilities of this leadership. If this is to come to pass, it behooves us with patriotic zeal to lay broad and deep the solid foundations of truth and noble ideals upon which shall be built the ever enlarging structure of a twentieth century civilization.

SOME RECENT INVESTIGATIONS UPON THE SECRETION OF MILK.

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

To the dairyman all that is of practical importance in milk secretion centers around the quantity and the quality of the milk. Experimental inquiry has been very active along these lines during the past ten or fifteen years and the chief embarrassment in attempting a summary of what has been undertaken and the results which have been obtained is the abundance and the variety of the data. The Station publications are replete with such results and in the paper which follows, the attempt is made to put in a compact and easily-to-be understood form the more important conclusions which have been reached, and some of the data upon which they rest. Desirable as it would be to insert references as to the authorities quoted, the limits of a popular paper will not for the most part, allow of such reference, and for the most part quotation marks are also omitted.

THE UDDER OF THE COW.

The udder of the cow consists of two glands lying horizontally side by side separated by a layer of tissues which help to support them. The glands are distinct from each other, as may be noted by examining the under side of the udder where the furrow separating them will be found. Each gland ordinarily has two teats on its lower side through which the milk may be drawn from that particular gland. Each of the four teats draws the milk from what is usually termed a "quarter" of the udder. The two teats on the same side of the udder are from the same gland. As the glands are distinct from each other, so in a measure are the "quarters." For example, it frequently occurs that cows have garget in one "quarter," while the other teat from the same gland, milks freely and appears healthy.

If an udder be dissected it appears somewhat spongy and pinkish, having numerous holes or canals, much like a sponge. When cut, milk escapes from the incision. Within each teat is a cavity from which the milk is drawn through the teats. At the lower end of each teat a small muscle encircles the outlet to prevent the escape of the milk. Each of the glands of the udder is composed of a quantity of structures somewhat resembling a bunch of grapes. That which may be considered to represent the bunch is called the lobe, the lobule corresponds to one grape and the alveoli are the smaller glands or ducts within the lobule. The alveoli are exceedingly small and can be seen only under a microscope of high power.

The actual secretion of the milk goes on in the alveoli. Exactly how the milk is secreted is not known. It is usually supposed that the process of milk secretion is two-fold; that one is a breaking down of the cells in the alveoli which form the fat of the milk, and the remainder of the process is purely a secretive one, much as saliva is formed in salivary glands. The assumption is sometimes made that in the milk glands of the cow, there are as many different and more or less independent forces at work as there are constituents of the milk and that each of these forces provides for the formation of a single constituent of the milk. A theory which seems to have a greater acceptance at the present time is that the milk glands are possessed of forces which are first of all directed to the formation of milk fat, and the other milk constituents, casein, milk sugar, mineral matters, etc., occur in a sense as by-products.

Bearing upon the above it is a well-known fact that as the period of lactation advances there is a marked diminution in the activity of the milk glands, and this effects the secretion of fat proportionally less than that of the other milk constituents. It is also well known that fluctuation in the regular flow of milk during lactation usually more largely affects the secretion of the fat and it is also frequently observed that to a certain extent the milk yield seems to be determined by the relative tendency of the milk glands to secrete fat.

However the milk may be secreted in the alveoli it seems to be well established that the milk finds its way through channels of the alveoli into the lobules and from there into the lobes and thence into the ducts where it is conveyed into the milk cistern above the teats.

THE MILK VEINS.

The nervous system of the cow is closely associated with the production of the milk. When the teats are stimulated either by the hands or the sucking of the calf, the nerves surrounding them become irritated, and through these the nerves of the secreting glands within the udder are excited, causing their contraction and the discharge of their contents. The action of the blood vessels and veins is affected by the activity of the nerves; ordinarily the greater the capacity of the arteries and veins connected with the udder, the larger the milk secretion will be. This shows the importance of securing cows with a strong development of the arteries or veins of the udder and abdomen. An examination of the belly of a good dairy cow reveals thereon, extending from the udder along each side, a milk vein one-half inch or so in diameter. The milk veins, at the point most distant from the udder, pass through what are called the milk wells in the walls of the abdomen. These openings through which the veins pass should be of good size so as to premit a strong flow of blood through them. As a rule, the greater the milk secreting power of the cow, the larger and more twisted of outline will these veins be.

While experts are able to judge from the general build of a cow much as to her capacity as a milker, the various rules or "points" which have been laid down for judging the merits of milch cows are of themselves uncertain. While the form of the udder is important, as also the size of the milk vein, a large, well-formed udder is not always a sign of productiveness.

The best cow in the Province of Brandenburg, Germany, as shown in milking trials lasting for a year, was small and unsightly in appearance and gave no external indication of so great productiveness. While the characteristics of the dairy cow, as regards conformation, temperament, etc., are helpful, intelligent breeders and feeders are exacting from their cows, at least a certain yield of milk per year of quality that will assure them a profit in their keeping. The use of the scales and the Babcock milk fat testing apparatus is of far greater value for determining the capacity of a cow than all the milk "signs" imaginable.

THE NUMBER AND SIZE OF FAT GLOBULES.

The fat is secreted in globular form and the size of the fat globules in the milk are of great practical importance, since as a rule the larger the globules the cleaner will milk skim and cream churn. Studies on the number and size of the globules show that as a general rule there is a steady increase in the number of the small globules and a decrease in the large globules as the period of lactation advances. From tests made in fractional milking it is learned that there is an increase in the number and size of the fat globules from the beginning to the end of milking.

There is an almost incomprehensible rapidity in the secretion of the globules. Assuming the milk secretion to proceed uniformly throughout the day, in the case of twenty-three cows giving a little less than twenty pounds of milk, there was an average secretion of 138,210,000 globules per cow per second. A study of the size of the globules at the Pennsylvania Station showed the relative size of the globules to vary more uniformly with the total yield of milk than with any other factor. In general, a decreased milk production is accompanied by a decrease in the average size of the globules and an increase in milk production from any cause is accompanied by an increase in the average size of the globules. The influence of the quality and the quantity of food upon the size of the globules appears to be indirect, the real cause being the variation in milk production. If this is true, and the hypothesis is well supported by observations, the method of feeding so as to produce the largest globules is the same as that required to produce the largest possible yield of milk consistent with keeping the cow in a normal condition.

IS THE FAT OF MILK A SECRETION?

Until recently the formation of fat has been commonly regarded as a result of a degeneration or breaking down of the epithelium cells of the gland. It has recently been shown that from the construction of the cells this position is untenable and that the formation of fat is not due to fatty degeneration but rather to an infiltration of fat which the cells extract from the circulating supply of blood and lymph. The cell secretes or separates the fat itself by extracting it out of the fluids furnishing it and no breaking down of the cells takes place. This is not a mere transudation of the fat, as it may be and usually is very materially changed in character by the alveoli.

THE REGULARITY OF MILK SECRETION.

With the idea that the fat of milk was the result of the breaking down of the cells themselves, the thought that milk formation went on more largely at the time of milking than at other times was common. In experiments with Holsteins, Jerseys, Guernseys and other dairy breeds, when the cows were milked at intervals of 12 hours each it was found that the weight of milk secreted from 5 P. M. to 5 A. M. was the same as that secreted from 5 A. M. to 5 P. M. The average amount of milk in these trials and its composition is shown in the following table:

	Morning's milk.	Night's milk.
Yield	.700 lbs.	.696 lbs.
Water	86.25 per cent.	86.39 per cent.
Solids	13.75 " "	13.61 " "
Fat	4.26 " "	4.22 " "

This and similar studies upon the uniformity of milk secretions seem to warrant the belief that the milk is formed continuously and uniformly. The flow of milk at the time of milking is usually much greater than the capacity of the milk cistern, but this is readily accounted for, as the irritation of the nerves causes the contraction of the wall of the glands and milk ducts.

THE SOURCE OF THE FAT OF MILK.

As long as the theory that fat of milk was formed from the fatty degeneration of the milk gland, and that it was not a secretion, prevailed, it was thought that the fat of the milk could not be directly derived from the fat of the food. Many experiments seemed to conform with this view and it was consequently generally held that the fat of milk was derived from body fat. At the same time it was held by many that the supply of fat in food was always sufficient to more than account for the amount of fat in the milk secreted. The predecessor of the present director of the New York Station compared in the case of a large number of cows the amount of fat in the milk with that in the food and concluded therefrom: "It would seem that until strong proof shall be submitted that the fat of milk is derived from other constituents of the food, its source at present must be held as the fat present in the food of the animal."

In experiments with a dog fed in different periods with nitrogenous and carbonaceous rations to which fat treated with iodin was added, it was found that a very considerable amount of the iodin fat was transmitted to the milk. In one case 23 per cent of the fat of the milk was iodin fat, while in a period immediately following in which no iodin fat was fed, 6 per cent of the milk fat was iodin fat which must have been derived from the body supply. These experiments indicated that body fat may be drawn upon for the production of milk fat, but that under like conditions the fat is more likely to be derived from the food fat.

By investigation it has been clearly shown that both protein and carbohydrates of food might be the source of body fat. The experiment which seems to indicate clearly that the carbohydrates may also be the source of milk fat was made by the present director of the New York Station and it is so important in its bearing on this question that a quite full abstract of the experiment is here given.

A cow fed during ninety-five days on a ration from which the fats had been nearly all extracted continued to secrete milk similar to that produced when fed on the same kinds of grain and hay in their normal condition. The yield of milk fat during the ninety-five days was 62.9 pounds. The food fat eaten during this time was 11.6 pounds, 5.7 only of which was digested; consequently at least 52.7 pounds of the milk fat must have had some source other than the food fat.

The milk fat could not have come from previously stored body fat. This assertion is supported by three considerations: (1) The cow's body could have contained scarcely more than sixty pounds of fat at the beginning of the experiment; (2) She gained forty-seven pounds in body weight during this period of time with no increase of body nitrogen, and was judged to be a much fatter cow at the end; (3) The formation of this quantity of milk fat from the body fat would have caused a marked condition of emaciation, which, because of an increase in the body weight, would have required the improbable increase in the body of 104 pounds of water and intestinal contents.

During fifty-nine consecutive days 38.8 pounds of milk fat was secreted and the urine nitrogen was equivalent to 33.3 pounds of protein. According to any accepted method of interpretation, not over seventeen pounds of fat could have been produced from this amount of metabolized protein.

As to the source of milk fat, the conclusion is reached that in these experiments the milk fat was produced, in part at least, from carbohydrates, as previous experiments have demonstrated to be the case with body fat.

The quantity of milk solids secreted bore a definite relation neither to the digestible protein eaten nor to the extent of the protein metabolism. The extent of protein metabolism seems to be influenced mainly by the protein supply rather than by the quantity of milk solids secreted.

Neither a deficiency in the protein of the ration nor a depression of the digestible nutrients to about 5.5 pounds per day caused the cow to produce poorer milk. The only apparent effect was in changing the quantity of product. The changes in the proportion of milk solids were due almost wholly to changes in the percentage of milk fat.

THE RELATION OF THE NERVOUS SYSTEM TO MILK PRODUCTION.

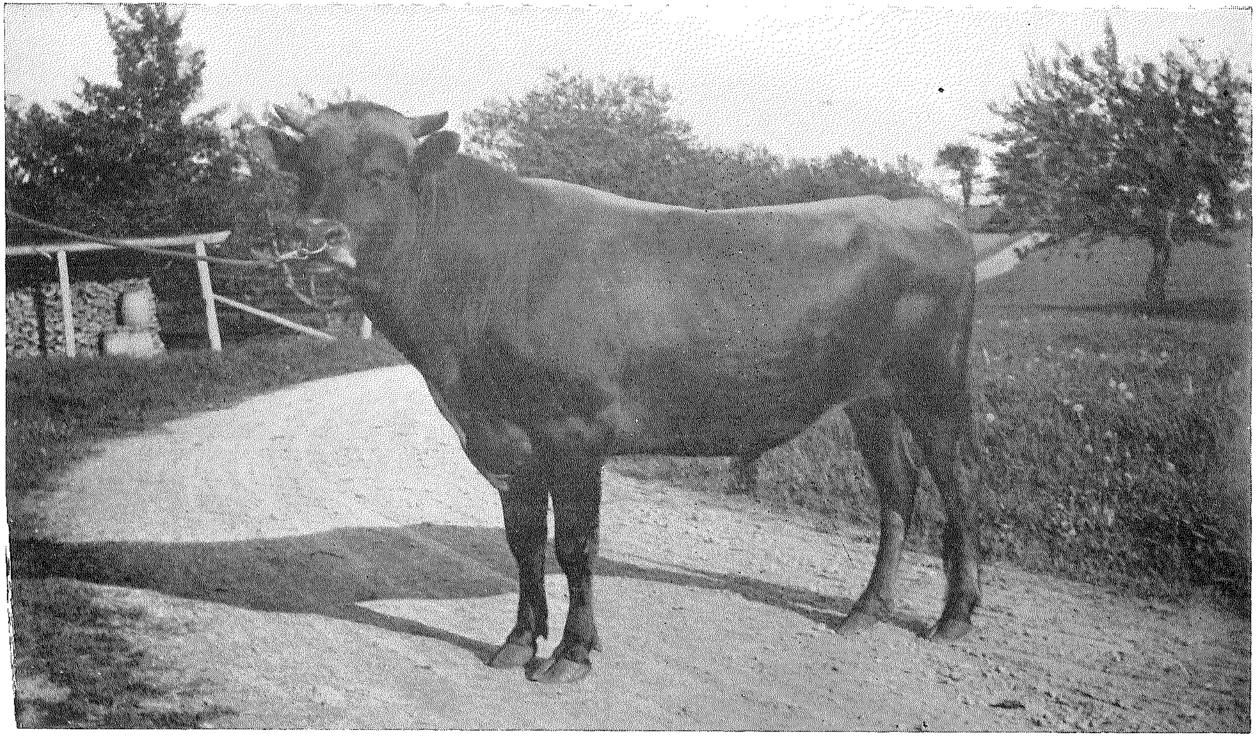
Can the brain or nervous system of a cow affect her yield of fat, and if so, in what ways and to what extent, is the interesting question that has claimed the attention of many investigators. That cows have more or less power to "hold up" their milk is well known, but to what extent she may at will affect the actual secretion is not so clear. A comparison between the amount of milk drawn from a cow by a man and a calf was quite largely in favor of the calf. When cows are milked one teat at a time, both the yield and quality, at least for short periods, are decidedly affected. The yield of fat in such trials fell off from one-fourth to one-third of the yield when milked in the usual way (both teats from the same gland at the same time). Tests made upon these subjects indicate that change of milker, manner of milking, and change of environment all exert a more or less decided influence, temporarily at least, on the quantity and quality of the milk produced, the fat being as a general rule more sensitive to such changes than the other ingredients or the total yield of milk. In tests in which cows were milked in from three to four minutes and double that time, the yield of milk seemed to be very little affected, but in every case richer milk was produced when the cows were milked fast than when they were milked slowly. Many studies by different investigators on the effect of the frequency of milking and the studies of fractional milkings seem to justify the following statements:

The secretion of any single ingredient, as fat, is not affected by the act of milking.

No considerable formation of milk takes place during milking.

Too frequent milking and allowing the milk to remain in the glands too long, both tend to diminish the secretive activity of the glands.

The process of milking in itself is without effect on milk production. Frequent milking, within certain limits, may result in an increased production of milk, not through the act of milking itself, but through the emptying of the glands.



A. J. C. C. BULL, MAJOR BRIGGS, 50572. Property of Jonathan Benn, Hodgdon.

EFFECTS OF TEMPERATURE AND WEATHER ON MILK SECRETION.

The effect of warm quarters upon milk production is uncertain. In a warm stable there is rather more milk and butter fat, on the average, than in an unwarmed stable, but in the climate of New England the increased production will not nearly pay the cost of heating. The most certain effect brought out by these experiments is the lowering of the percentage of fat in the milk in the warm stable. With moderate artificial heat better ventilation can be secured, without making the stable too cold for the comfort of its occupants, than is possible without artificial heat.

In experiments upon the effect of warming the water used for cows, it was found that there was an increase of five to eight per cent in yield of milk and butter fat with water at seventy degrees F. on that at thirty-two degrees. On the average more warm water was drank.

From studies upon the effect of weather upon milk production with many animals over long periods of time, the following summary fairly represents the case:

There seems to be a general tendency of the quality of the milk to become richer in fat content when the temperature is falling, and less rich during a rising temperature.

Concerning the changes in the milk occurring simultaneously with storms, if these changes are considered to be due to the effect of rain storms, they seem to indicate that cows in flush of milk on pasture feed give as much or more milk and of just as good quality in bad weather as in fair weather, and that when the storm is over they give a less quantity of richer milk. The cows do not appear to make any change in quantity or quality of milk on the approach of a storm, and no connection is traceable between the storms and the pounds of butter fat produced.

EFFECT OF EXERCISE AND FATIGUE ON MILK PRODUCTION.

It is found that with moderate work (not exceeding two hours a day) the yield of milk is decreased, the decrease being due to a decrease in the water content of the milk, as the milk was more concentrated when the cows were worked. The principal effect is on the percentage and total amount of fat, both of which are increased. There is a decrease in all of the constituents of the solids except the fat, and especially in the case of milk sugar. Seven German experiments are reported in which a number of cows were driven a considerable distance, in some cases up a mountain, and the milk analyzed for a number of days before and after the trip. These experiments were made on different cows, in different parts of the country (Germany) and under varying conditions. They all showed that heavy exercise influenced both the quantity and the quality of milk. The quantity of milk diminished, and also the absolute amount of milk constituents. This decrease was more or less noticeable in the first milking after the trip, according to the severity of the exercise, and was much more noticeable in the second milking. The water content decreased in the first milking and more in the second milking, then gradually returned to the normal. The casein content increased in the first milking, remained about the same in the second milking, and then gradually sunk to the normal. The fat content was much increased in the first milking, according to the severity of the trip, was still larger in the second milking, and then gradually sunk to the normal. The sugar content decreased in the first milking and usually rose again to the normal in the second and following milkings. The ash content was noticeably higher in the first milking after the trip, and then sunk to the normal.

In two cases the effects of fatigue are reported where ten cows were driven ten miles and shipped fifty miles by railroad. While considerable individual variation was observed, on the average the quantity of milk was lower as an immediate result, but normal flow was nearly restored by the end of the second day. The fat percentage dropped during the first day and was decidedly increased the second day, remaining a little high during the next few days, as compared with the flow of three weeks later. Solids-not-fat averaged about the same, except for the second milking. "It seems safe to conclude as a result of the two tests that fatigue tends to lessen the milk flow temporarily, to affect variously its quality for the first one or two milkings, and to raise the quality for a while after the second milking."

The above cited results all agree in pointing out that causes and circumstances affecting the nervous system have marked effects, at least temporarily, on milk secretion. Usually circumstances which affect the animal unpleasantly decrease production. In these cases the fat is the constituent most considerably affected. Most of the experiments upon this class of subjects are of short duration and there seems to be a tendency under longer continuation of the conditions for the cows to adapt themselves to the change and gradually return to their usual secretion of milk.

COMPOSITION OF AND VARIATIONS IN QUANTITY AND QUALITY OF MILK.

As is well known, milk consists of water, casein and albumen, fat, milk sugar and mineral matters. The exact amounts of these different constituents in case of different herds, and different periods of lactation, vary within wide limits. As has been stated several times in this paper, the fat is the most variable as well as the most valuable of these constituents. So far as the quantity and quality (as measured by the butter fat) are concerned, the following statements seem to be justified by observations which have been made with a large number of cows of many herds for numerous periods of lactation:*

All cows shrink in quantity of milk as they get farther from calving. If they are farrow, this shrinkage in quantity is accompanied by almost no change in quality, even until they go dry, provided they are still farrow. If they are in calf the milk increases in quality as it decreases in quantity; this increase is slight, only one-twentieth during the first six months after calving, but becomes quite pronounced just before the cow goes dry.

The milk of a cow for the first few days or weeks after calving is very variable in quality. On the average it is thinned just after calving, becomes slightly richer during the next two weeks, and then holds almost uniform in quality for the next four or five months.

Cows vary in the quality of their milk from one milking to the next, and from day to day, the quality rising and falling

*A quite full discussion of this subject can be found in the report of the Vermont Station for 1895, pp. 157-186.

without apparent cause. Such changes are usually within one per cent of fat, but it is probably possible that cases may occur of a doubling in the richness of the milk during different times in the same period of lactation.

The following illustrates the variation in percentage of fat which may occur in the milk of cows from day to day: The mornings' and nights' milk of a Jersey cow was analyzed on eight consecutive days, the food, environment, and time of milking being exactly the same each day. The highest percentage of fat found was 5.32 and the lowest 4.45, a difference of .87 per cent. The variations which may occur from day to day in the composition of the mixed milk of a herd are illustrated by analyses of the mixed milk of a herd of thirteen cows for a period of thirty-two days. The percentage of fat ranged from 3.63 to 4.59, an average of 4.19, and the amount of fat from 6.48 to 11.78 pounds per day.

Just after calving the milk is poorer in fat, and in solids not fat, than just before the cow goes dry. Most cows give about the same quality of milk year after year, beginning with this quality at the first calving. There is no general tendency for the milk to become either richer or poorer as the cow grows older.

From one calving to the next, cows may be expected to vary the general quality of their milk not much more than a sixth of one per cent of fat, and scarcely ever will show an average variation of more than a quarter of one per cent.

EFFECT OF FOOD ON QUANTITY OF MILK.

There is a unanimity of opinion by practical men and scientific men alike that the food has a greatly determining effect upon the quantity of milk secreted. Feeding an insufficient ration under otherwise like conditions always decreases the amount of milk secreted. Abundant experiments indicate the importance of maintaining a proper ratio between the flesh-forming (protein) constituents of the food, and the energy-producing constituents (the fats and the carbohydrates). The standard prepared by Wolff calls for each 1,000 pounds of live weight, 2.5 pounds digestible protein and sufficient digestible carbohydrates and fats so that the ration shall have a nutritive ratio* of 1:5.4. The standard suggested by the Wisconsin Experiment Station calls for 2.15 pounds digestible protein and sufficient fats and carbohydrates to make a nutritive ratio of 1:6.9, and the Storrs Station suggests a ration containing the same amount of digestible protein (2.5 pounds) as the Wolff ration and slightly more digestible fats and carbohydrates so that the nutritive ratio is 1:5.6. Just what the size of the ration should be and what its nutritive ratio in order to get the best results is a matter of uncertainty, but that the size of the ration and its nutritive ratio are the determining factors on yield of milk is generally accepted. It seems to be well established also that dry fodders do not give as large a milk flow as succulent foods. At the Halle (Germany) Station it has been found that the milk flow increases regularly with the increase of watery foods until the water is carried above 100 pounds per 1000 pounds live weight a day. To avoid misunderstanding on this point it should perhaps be added that the results of experiments against feeding meals wet up with water ("slops") seem to show a decrease in the milk yield without affecting the quality of milk. In the case of cows changed from barn to pasture it has been repeatedly found that there is a marked increase in milk flow notwithstanding that most of the herds had grain while in the barn and none while on pasture. The increase which comes when the pastures are dry in the late summer from the feeding of corn fodder is marked and well known. Time and space will not permit a summary of the work along the lines of the effect of food upon the quantity of milk secreted, but the following results are typical of the reports of most exact feeding tests on the subject:

EFFECT OF RATIONS OF VARYING NUTRITIVE RATIOS ON THE SECRETION OF MILK.

The animals were fed in four periods. First, the nutritive ratio of 1:8.2; second, the nutritive ratio of 1:5.4; third, the nutritive ratio of 1:4.3; and fourth, the nutritive ratio of 1:8.2,

*The nutritive ratio is the ratio of the protein to the fuel constituents of the food, and is found by dividing the sum of the weight of the digestible carbohydrates and two and one-fourth times the weight of the digestible fat by the weight of the digestible protein contained in the ratio.

the same as the first. All three rations contained practically the same amount of dry matter and very nearly equal amounts of digestible non-nitrogenous matter. Cows were milked three times daily and daily analyses made of the mixed milk of each cow. There was little variation in weight from day to day. There were no changes in the percentages of fat which could be attributed to changes in the food. In the amount of milk and the total amount of fat, there were marked changes.

In the case of each cow the absolute yield of milk and fat increased with the increased protein consumption, this being the greatest with the change from the first to the second ration. When in the fourth period the cows were changed back to the wider ration, they all shrunk in the yield of milk and fat.

There was a gain in weight on the rations of the second and third periods, and a loss on that of the fourth period. The results show that it is possible by rich feeding to maintain a yield of milk and fat well up to the end of the period of lactation, and that on the whole liberal rations, and especially rations richer in protein than Wolff's standards were the most advantageous.

LEHMANN'S STANDARD RATION FOR MILCH COWS.

The experiments in this country and abroad seem to indicate that for the production of milk there is need of a liberal proportion of protein in the food. Just why so much protein is necessary, physiology is not yet able to clearly explain. It has been suggested that the influence upon milk secretion of an abundant supply of digestible protein in the ration is due to the influence of protein upon metabolic activity rather than because so much is needed to form milk solids. Whatever the explanation, the fact seems fairly well established that a liberal supply of protein is favorable to increase in the amount of milk secreted.

The feeding standard prepared by Wolff thirty years ago was modified by him from time to time in accordance with the teachings of experience and experiment. Recently Dr. Lehmann has made changes in this standard for milch cows so as to provide rations fitted to the actual milk production. In these standards he has made the ration narrower as the amount of milk secreted is larger. The standard rations as prepared by

Dr. Lehmann for cows per 1,000 pounds live weight with different milk yields are as follows:

Milk per cow per day.	Protein.	Fat.	Carbo-hydrates.	Nutritive ratio. 1:
11 lbs.	1.6 lbs.	.3 lbs.	10.0 lbs.	6.7
16 "	2.0 "	.4 "	11.0 "	6.0
22 "	2.5 "	.5 "	13.0 "	5.7
27 "	3.3 "	.6 "	13.0 "	4.5

EFFECT OF FOOD ON QUALITY OF MILK.

The question of the effect of food upon the composition of milk has called forth a variety of opinions and much experimental work, and is at present regarded by many as unsettled. In the opinion of most investigators, after a certain point is passed food is only of secondary importance and the quality of the milk depends upon the natural capacity of the animal and the glands for secreting milk. By some investigators and by many practical feeders this point is not considered as settled.

CAN THE PERCENTAGE OF FAT IN MILK BE LOWERED BY SCANTY FEEDING?

In the case of short periods (ten days to three weeks) the results of the experiments seem to be entirely consistent with the conclusion that scant feeding or the feeding of unbalanced rations exert an entirely insignificant influence on the fat content of milk. The results of all of these experiments which have come to my notice are summed up in the following conclusions of one such test:

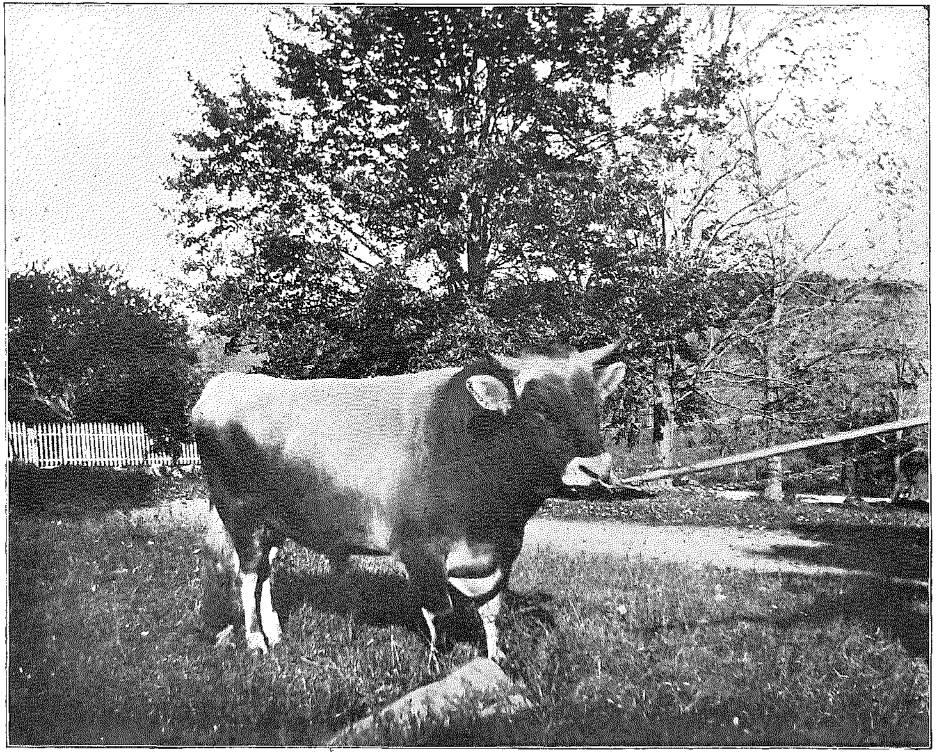
The animals were fed for two weeks on rations which were insufficient. The cows lost in weight, and in some cases there was a slight shrinkage in yield of milk, but the composition remained practically unchanged, indicating that it is the flesh of the animals that first declines when the aliment is insufficient.

In the case of long continued scantily and poorly balanced feeding, it seems to be clearly established that the fat content of the milk may be materially reduced below the normal. This is illustrated by observation upon cows in Norrland. During the period from January to May, Norrland cows are in general fed only a meager allowance of marsh hay and are therefore in a very poor condition when turned out to pasture in June. The results of about 2,000 analyses of these periods of feeding show that on rich pasturage their milk carried from 2.65 to 5.8 per cent with an average of 4 per cent of butter fat, and that on scant stable feeding the milk carried from 1.10 to 4.6 per cent, with an average of 3.25 per cent of butter fat. In discussing these results the author concludes that the fat content of milk cannot be increased at will by increasing a normal ration, but on the other hand that it can be greatly decreased by scant and poor rations. If a change is made from a deficient to a normal ration, the fat content of the milk will again be raised to the limit determined by the inherent qualities of the individual cow. This point is more or less generally accepted and is of practical importance in the case of ordinary feeding only as it indicates that cows may be below their normal for some reasons and that a proper ration may apparently increase the percentage of fat when in reality it is only bringing the animals up to their normal quality of milk.

CAN THE PERCENTAGE OF FAT BE RAISED BY LIBERAL FEEDING?

Up to the publication of a paper by Soxhlet in 1896 there was little diversity of opinion among American investigators on this subject. It was generally accepted that the addition of nutrients to an already normal ration would not increase the percentage of solids in the milk or the percentage of one or more of the constituents of the solids. Hundreds of feeding experiments with cows on different rations have been made in which the milk has been analyzed and exact records of the percentages of fat have been kept. These tests have been made with all kinds of feeds and with a very general agreement that changes of feed when cows were previously well fed were without effect on the composition of the milk. The general opinion among investigators, at home and abroad, is illustrated by the following abstracts from the results of feeding experiments in many countries with many animals:

A Danish investigator speaking of extensive feeding experiments in Denmark says in substance, the experiments prove that the feed under practical conditions, as found in this country,



A. J. C. C. BULL, PETER, OF MEADOW BROOK. Property of I. N. Lapham, Pittston.

exerts an entirely insignificant influence on the fat content of the milk.

Another investigator says: The complete chemical analyses of the samples of milk from the different lots failed to disclose any decided difference in the composition of the milk attributable to the different concentrated foods fed, and the author therefore concludes that in the comparative feeding trials with milch cows now continued for seven consecutive years at this station, in which 1,639 cows have been included (separated into 161 lots on ten estates in different parts of our country) it has been found over and over again that the changes made in the food of the lots have had practically no influence on the chemical composition of the milk. In these experiments grain has been fed against roots, against oil cake, and against wheat bran or shorts; grain and oil cakes have been fed against roots, or roots have been fed as an additional food.

An investigator in Scotland speaking of the results of his experiments says: These experiments plainly indicate that while many foods appear to have a tendency to enrich or impoverish the milk, still neither effect is permanent, the inclination after a time being for the milk to return to its more normal composition.

The consensus of American investigators on the effect of different rations is illustrated in the discussion of the results of a feeding experiment which may be concisely stated as follows:

About five per cent more milk was produced on two pounds and ten per cent more on 2.5 pounds of protein daily, than when the animals received 1.5 pounds each. The quality of the milk was scarcely changed.

Such was the situation in 1896 and the subject would have been considered closed, with the evidence all in and verdict rendered had it not been that in that year a distinguished German investigator published a brief account, without giving the data, of experiments in which the percentage of butter fat was materially increased in milk by feeding tallow in the form of emulsion. In this paper Prof. Soxhlet pointed out that in some of the experiments which have been regarded as conclusive on certain points and which have had much to do with shaping the general opinion of the effect of food on milk, rations were fed which were less digestible than was assumed, i. e., that the particular substances tested, like fat, were added to the basal ration in such form that they were not digested by the animal. Hence, no effect could be reasonably expected. His investigations lead him to believe that there is no direct transmission of fat from the food to the milk, as some have held; but that normal milk fat is a product of the activity of the lacteal glands, and that its source is the body fat of the cow. The fat of the food affects the secretion of milk fat by replacing a part of the body fat, and thus causes a transmission of the body fat to the milk. He is confident that the fat of the food can effect a one-sided increase in the fat content of the milk; but he states that fat is the only food constituent capable of doing this.

The first brief account of Soxhlet's work is all that has been given, and whether the experiment was confined to one cow and whether the reported increase in yield of fat was continued more than for a few days is not known. As the result of the publication of this experiment a renewed interest was taken in the subject and numerous experiments have been made. While the later findings are not in accord with Soxhlet's results, they are of sufficient interest to warrant a brief review, particularly as they have led to a series of experiments on the effect of fat in food upon butter, which is discussed further on.

Tallow feeding at the New York Cornell Station resulted as follows: Five cows of different ages kept at pasture were fed a ration of equal parts of wheat bran and cotton seed meal, with the addition of cornstalks, silage, or hay when the pastures began to fail. For ten weeks they were given tallow in addition, beginning at the rate of four ounces per animal daily, and gradually increasing the amount four ounces at a time until each cow was eating two pounds daily. Similar experiments were carried out with five two-year-old heifers which had recently calved, and a winter trial was also made with five two-year-old heifers which had recently calved.

No difficulty was found in getting the animals to eat the tallow. The health of all the animals remained good, and no appreciable change in live weight took place. There was no marked change in the percentage of fat and yield of milk in the period when the cows were on a full feed of tallow. While there are slight variations in the percentage of fat, they rarely reach 0.5 per cent, and, what is of more significance, they are not uniform. Some of the cows gave richer milk and some poorer on a full feed of tallow than they did before or after.

In experiments at the New Hampshire Station, the first effect of feeding oils was to increase the fat in the milk. The sharp increase in fat was followed by a decrease until the milk again reached its normal composition. The results of this work are summarized as follows:

The first effect of an increase of fat in a cow's rations is to increase the per cent of fat in her milk. With the continuation of such a ration, the tendency is for the milk to return to its normal condition. The increase in fat is not due to the oils but to the unnatural character of the ration. The results in this experiment tend to confirm the conclusions that the composition of a cow's milk is determined by the individuality of the cow, and that although an unusual food may disturb for a time the composition of the milk, its effect is not continuous.

The results of German experiments suggested by Soxhlet's results show that the percentage of fat in the cow's milk as a rule increased during the first four to six days of oil feeding, in single cases nearly one per cent; after ten to twenty-five days, however, the fat content again became normal, in spite of the fact that the oil emulsion feeding was continued. The yield of milk and of fat changed with the oil feeding in the same manner as the percentage of fat in the milk. Another German investigator finds as the result of experiment that the fat content of the milk was increased at first by feeding large quantities of oil in the form of an emulsion, but later on no increase took place; the milk, on the contrary, dropped to its previous normal fat content, depending on the individuality of the cow.

These experiments on the whole indicate that the effect of even very abnormal food materials is not to permanently alter the composition of milk, and one is forced to the conclusion that Soxhlet published prematurely the results of too short experiments. The final conclusions thus far reached indicate that the further addition of nutrients to a normal ration has little or no permanent effect upon the percentage of fat in the milk. The results of these experiments and others of similar kind are making clear the necessity of using long (four weeks or more) feeding periods and the unreliability of conclusions based upon a test of only a few days duration.

EFFECT OF FOOD ON BUTTER AND THE COMPOSITION OF BUTTER FAT.

The experiment reported upon by Soxhlet which led to the feeding of oils and fats stimulated a study upon the relation of the character of the fat of the food and that of the milk, and tends to throw some light upon the source of the fat of milk.

Investigations by the Stations made nearly ten years ago agreed in giving conclusions of which the following are typical:

The tendency of butter to melt during hot weather may be influenced by the kind of food, and also the degree of hardness may be affected.

A mixture of cottonseed meal or linseed meal with corn meal and wheat bran, especially the cotton-seed meal mixture, produced butter less easily melted and of a more solid appearance than did the peas and barley.

Gluten products containing large percentages of oil produce soft butter. Gluten meal tends to make soft butter, while cottonseed meal tends to make a hard butter. The hardness of butter seems to depend more upon the character of the food than upon its nutritive ratio.

The recent feeding of oils and fats as large parts of rations has given results upon the composition of the fat of milk and butter of which the following are fair illustrations:

Cows fed on cottonseed oil produce milk the butter fat of which gives cottonseed oil reactions. The reactions appear when the cows receive only a small quantity of oil. They increase somewhat with continuous feeding, but apparently cannot be carried beyond a certain point. The reacting substance passes into the milk within less than twenty-four hours after the feeding begins, and continues to do so for several days after it has been dropped.

The sesame oil had a marked influence on the appearance and taste of the milk and increased the index of refraction, diminished the volatile fatty acids, and increased the iodin number of the butter. The butter produced on cocoanut oil was normal in appearance, but had an unmistakable taste of cocoanut oil. The index of refraction of the butter was materially diminished, the volatile fatty acids were slightly increased and the iodin number was noticeably diminished. On almond oil the butter showed a positive increase in the index of refraction, and the iodin number increased. The authors conclude that the feeding of oils not only greatly changed the butter, but that the changes followed in general the characteristics of the oils themselves.

The examinations of the butter fat showed that the volatile fatty acids decreased greatly during the linseed oil feeding. This effect of the oil feeding was much more persistent than on either the yield or fat content of the milk, and on discontinuance of the oil feeding the return to a normal volatile acid content came but slowly. The iodin number rose and fell rapidly with the feeding of oil and discontinuance of it. As only small quantities of linoleic acid were found in the fat, the increased iodin number must have been due to an increase in the olein content of the fat on oil feeding. The index of refraction changed in the same manner as the iodin number, the curves for the two sets of determinations following each other closely throughout the experiments. The increase due to the oil feeding was very marked and rapid, with the maximum appearing about the fifth day of the oil feeding. The melting point of the fat increased in the same manner as the iodin number, viz., from 35.4 to 39 degrees C.

The above results seem to warrant the general conclusions that when a large quantity of fat is supplied to the animal organism in the food it will, after having been transferred to the blood, be secreted as milk fat, but the secretion cannot be looked upon as a direct transmission of the fat from the blood to the milk glands. The fat added will be worked over in passing through the alveoli cells of the milk gland in such a manner that a large amount of olein and a small amount of fat having a high melting point are formed. If there are large quantities of drying oils in the fat consumed, these will be changed to non-drying oils before being secreted in the milk.

SOME OF THE CONCLUSIONS REACHED.

Although the physiological side of milk production is incompletely understood, and there is need of much investigation before definite statements can be positively made, the results of a present knowledge seem to warrant the following general summary:

The secretion of milk is closely related to the nervous organism of the cow and anything which affects the nervous system may temporarily affect both the quantity and quality of the milk. Under normal conditions milk secretion proceeds uniformly during the twenty-four hours. Under usual conditions the fat of the milk is partly derived from body fat but chiefly from the fat of the food. The fat is not directly transmitted from the blood, but is modified and worked over by the alveoli. The quantity of milk is largely determined by the quantity and quality of the food. Under usual conditions the quality of the milk is but little affected by the food. If for any reason the quality of the milk is temporarily changed there is always a tendency to return to the normal.

When a cow in good condition is in full milk she will give her normal quantity of milk at least for a limited time, even though the quality or quantity of her food is deficient.

When in good condition a heavy milking cow will take flesh or fat off her body in order to give her normal quality of milk.

If the food ingredients are present in sufficient quantity in a state palatable to the animal and easily assimilated it does not seem to make much difference from what source they come.

The percentage of butter fat in milk is very little influenced by foods containing a large percentage of oil, such as linseed or cotton-cake, nor yet by albuminous foods, such as bean or pea meal, decorticated cotton-cake, etc.

The composition of the butter fat is modified within narrow limits by the fat of the food.

Any increase in quantity or quality of milk over the present normal standard is to be looked for more from breeding than from feeding.

There is a tendency for the milk capacity of the cow to be transmitted to her descendants with usually only small change in quality and quantity. By proper feeding the heifer can be developed to her normal quality of milk. How far the quantity may be thus inireased is unknown. The hope of improvement of dairy stock is in wise breeding and in careful selection and judicious feeding of the young stock.

SANITARY CARE OF MILK AND CREAM.

By H. B. GURLER, Dekalb, Ill.

What I say to you this afternoon will be along the lines of a new enterprise in which I embarked five years ago. I will tell you what I am doing, and then I will try to show you how I think many of you could follow the same lines, to a degree, at least. A little over six years ago the medical profession of Chicago commenced to labor with me to induce me to produce, as near as possible, a pure milk for infants and invalids in the city of Chicago. At first I was not at all inclined to take hold of it. I was fearful of the financial outcome of the enterprise, but after laboring with me for nearly two years they induced me to undertake it. The first move was to turn my herd of 130 animals over to the State Board of Health and Stock Commission and have them tested. I was satisfied that I had some tuberculosis in the herd. It required some nerve to do this, as I did not know where I should land, but it was necessary if I went into that field. Several cows that I had bought proved to be tuberculous, but none of the animals that were raised on my farm had the disease. Those tuberculous cows had been wintered with twenty-five other cows, but not one of those other cows, which I had raised, had contracted the disease. I mention this to show that my experience goes to prove that tuberculosis is not so contagious in the bovine family as some people are fearful. After getting my herd tested I had to build my stable over somewhat and put in cement floors. I had in some of the stables the King system of ventilation, by which the air is taken up in the wall, coming through on the outside at the sill and inside at the ceiling. The impure air is drawn out through flues near the floor. I have plenty of light. We have cement floors and cement mangers. I have a stall which is a combination of the Bidwell, and some ideas of my own. The idea is to have a stall in which you can keep the cows lined up on the gutter. In the old way of lining cows on the manger you may have a platform that will fit a portion of the cows, but it is impossible to get it to fit all of the cows. With a stall in which you can line the cows up on the gutter, there is very little trouble in keeping them clean. There will be some that will get soiled, but it is very little work to cleanse them, with a curry comb, or what is better, and what I use, is a pail of warm water and a sponge. Go over them once a day, and oftener if necessary. It takes but little time, and it ought to be done. It pays you to do it. I think most of you know the make-up of the Bidwell stall. It is really a box stall, from 3 feet to 3½ in width, with a swinging partition. The partition is hinged in the center, so that if you go in to milk, you just unfasten a little fastening and swing this against the cow, behind you. This partition is at your back as you step in to milk the cow. The cow is detained in the stall by a rope or chain hitched across the rear just over the edge of the drop. The manger is an individual manger and adjustable to the length of the cow, so that you keep her lined on the gutter. That is the principle of the Bidwell stall. What I objected to was the individual mangers. It was too much labor to keep them cleansed as I wanted them for my high grade work, and I gave a good deal of study to putting in a continuous manger. Now I have a continuous cement manger, and I have hanging from the center of this manger an adjustable lattice work front that I can move back and forth instead of moving the manger. By having my platforms made of different widths, from four feet and seven inches to five feet, and this adjustable piece of open work in front, I can fit almost any cow and keep her clean.

In caring for the cows, we are very careful to give them sound food, whether it is hay, shorts, corn or silage. It will not do to have any decayed or mouldy food of any kind and expect to make a high grade product, whether it is butter, milk or cheese. The cows are groomed about a half hour before milking, and then just in advance of the milkers a man goes with a pail of warm water (warm when the season requires it) and a sponge for cleansing the udders. One man can cleanse the udders for nine or ten milkers, if the cows are conveniently situated. In my early work I had each milker go over his row of cows and cleanse them before cleaning himself up. But I soon discovered, as the cows were put from the other stables into this certified milk stable, that there was very soon a shrinkage in the milk, and it worried me. I did not know what to think. My first thought was that the cows had been injured by the tuberculin test. Finally, with the aid of a woman, a mother, I evolved this idea,—that manipulation of the udder in the cleansing stimulated the secretion of milk, and to get the best results you must follow that right up, and relieve the cow of her milk at once, or else there is a reaction that makes trouble. That solved the whole question. Then we discard the first few streams of milk from each cow. It has not much value anyway, there is not much fat in it. We milk through an absorbent cotton strainer applied to the top of the pail. This is regular surgeon's cotton. It is confined between two layers of gauze and put over the top of the pail and confined there. The pail is emptied through a covered spout, so the pail is not opened, only the spout is opened when the milk of each cow is weighed. From the barn this milk is carried in cans to the milk house and there it is put through a centrifugal separator. The foundation thought in the use of the separator was to enable me to hold my milk with a constant percentage of fat, or cream. This was necessary on account of its being used for baby food. The doctors must have a milk that is constant in its properties, to practice the home modification of the milk intelligently. They could not do that with a milk which varied as the milk of a dairy will at different times of the year. If you had a dairy with a few cows coming in right along regularly the whole year round, there would not be much variation. But in my creamery work I have found a variation between the highest and the lowest test of a month of over 1¼ per cent. In running the milk through the separator, as the skim-milk and the cream run out in two streams they are allowed to run right back together and we can catch from one or the other as we need, to bring the percentage up or down. I need oftener to catch skim-milk than cream, to hold it up to four per cent. I have a mixed herd, some Jerseys, a few Guernseys, and many Holsteins and Shorthorns. The milk is put through a cooler. I use a Star Cooler, and in warm weather I use ice. It then goes into the bottling machine and is put into bottles and wooden caps applied. I also apply a metal cap and a seal. This is to prevent anybody from tampering with the milk. The metal cap is a disk with four little arms that bend down. Then there is a strip that runs around below the rim of the bottle and gathers those arms in. This strip has a little lead seal, so that we get it in a condition that it is utterly impossible to remove the metal cap from the bottle without breaking the seal. On this seal we stamp the date that the bottle was filled. The reason for doing this is that the milk is delivered by agents in the city of Chicago. My agents are milk dealers, who deliver this milk in connection with their own milk. We pay them a commission for delivering. I adopted that method because I could see plainly enough that I should ruin the enterprise if I undertook to deliver it myself. When the business was in its infancy it was impossible for me to deliver a small amount of milk all over the city with the promptness necessary for infant feeding. The medical profession were persistent at first that I should deliver it myself, but I told them that I would not undertake to do that. I told them the plan which I had thought out, and they consented to let me start out on that plan. I soon brought out this metal cap and seal, and this has quieted all their demands. My agents are running over 125 wagons, and the milk is distributed from the wagon that is going where it is wanted. The bottles after being sealed are put into cases, and the cases filled up with chopped ice. We use ice enough so that there is ice with the milk all the way to market. I have had some interesting experiences with this milk. There has been a lot of detective work done which was legitimate and all right. One of the first things along that line was done by the Chicago Health Department. They telephoned to one of my agents one afternoon that they wanted to get a case of milk. They would not tell who they were; all we could learn was that they were cash customers. They got the case of milk and paid for it, and that was all we knew about it for several months. At last the bacteriologist, Dr. Gurman, told me what they had been doing. He said they took that case of milk over to the city hall and put it into a refrigerator and tested one bottle each day, for fat, acidity and bacteria. The last bottle was two weeks old when they tested it, and the health commissioner, Dr. Reynolds, and the bacteriologist, drank the last bottle of milk and said it was as sweet as a nut. I tell you this to show you what it is practicable to do. Mr. Hewett, the son of the old president of the North Western Railroad Company, on one of his trips took a case of my milk. It was taken ten miles into the woods, and the last bottle was used when it was ten days old. When Mr. Hewett returned to Chicago he told the freight agent there of the success he had with the case of milk, and asked him if he supposed that milk was embalmed. When I saw him he told me that the last bottle was the best bottle in the case. The only reason that he could possibly have had for saying that was that the cream might have become more solid than when it was two or three days old, and might appear better.

Ques. Is this milk heated?

Ans. No, sir. One of the first ideas which I started in with was to get beyond the need of any application of heat. I am not going to criticize pasteurization or sterilization, but I do claim that they are a means of covering up a multitude of sins. I do not deny that in the average milk there is plenty of animal life that you can destroy by heat. But I think it is a great deal better to produce that milk in such a way that it does not need that application of heat, and it is thoroughly practical to do so. At one time the Chicago University took up the study of bacteriology in milk, gathering samples from all sources in the city. They got a sample of my milk from the family of one of the professors, where it was being used for an infant, and the analysis of that milk, in comparison with the other milk, showed so few bacteria that they were suspicious of their own work and sent back to get another sample. This did me more good than two or three hundred dollars worth of advertising.

I will mention one more case along that line. Before the opening of the Paris Exposition, Major Alvord, of the Dairy

Division at Washington, wrote me requesting me to make a milk exhibit. He said he wanted me to send some of the bottles with the seals applied, some of the seals, a milk pail ready for use, and some photographs of the new cow stable. I did so, and to my surprise was awarded a gold medal. Then he wrote me that he wanted me to send over some milk. That nearly took my breath away, but I went out to the farm on the afternoon of August 28th, and took the milk just as it came from the barn. I did not go to the barn to do any selecting of cows or milkers. I took the milk as it was bottled and put it into cases and put in the chopped ice. All the difference from my every-day work was that I revolved the bottles in the ice for a time to get the milk cooled more quickly. That milk was shipped August 29th from Dekalb, Ill., was put on board the vessel September 1st, and reached Paris September 15th. Major Alvord wrote that the first acidity was detected on the evening of September 28th. I do not know that anybody was more surprised than myself. Gentlemen, this shows you what it is possible to do if you will have your cows clean and have your stable clean so that the air is not permeated with germs, and cool the milk down as soon as possible after it comes from the cow and hold it at a low temperature. I am confident that I can prepare milk any day and have it sweet for thirty days, but I have to hold it down near to freezing temperature. I cannot let it get up to forty-five or fifty and be sure of having it sweet at that length of time.

The Illinois Experiment Station sent a man to make exposures of plates about my stable. He also went to various other places in the northern part of Illinois. When they summed up their work they sent me a report. The size of the plates was 3x4, or twelve square inches, and the average of the exposures made under the udders of the cows, in the various places in the northern part of the state, was 2,023 bacteria. In my stable it was 200, or less than one-tenth. The average in other parts of the stable, away from the cow, was 164, and in my stable it was thirty-seven. One exposure was made in my milk room, where the milk was held, and just two germs were found on that plate. You cannot have milk that is right and do the milking in a stable that is full of floating life. The milk that comes from the udder of a healthy cow, after the first few streams are taken, which rinse out the milk channel, is practically sterile. The germs get into the milk from the impure and unsanitary surroundings. I have seen men who seemed to think that the germs were a part of the milk. They would talk about the animal odor, and seemed to think you had to have it, when the facts are that animal odor is filth odor, pure and simple. We consume more filth in our milk than in any other one article of food. If we will take care of our cows and our milk with the neatness with which the women prepare the balance of our food we shall have no trouble with animal odors. But we are a long way from the ladies' standard of neatness. The most of us do not half appreciate how far we are from it.

Gentlemen, there are opportunities all over this country for doing a work similar to what I am doing, and doing it at a profit. In the smaller towns probably you cannot afford to go to all the expense which I have put into the work, but there is room for you to do something in that line. You are not obliged to put in cement floors. A cement floor is better, as it can be kept cleaner. In my stable the floors are all scrubbed out every day, with a hose and scrub brush. For the first two years I used one stable with a plank floor. We scrubbed it out as we did the cement floors, and used gypsum as an absorbent, and we were enabled to keep the atmosphere sweet in the stable. One of the neatest compliments I ever received was when a certain gentleman told a lady that he could blindfold her and lead her through my stable and she would not know that she was in a cow stable. There are lots of stables in which we could not stay three minutes without our wives and daughters being able to tell us where we have been. That should not be so. When the air is in a condition to impregnate our clothing it is in a condition to load the milk with germs. I tell you, gentlemen, it is time we woke up. The intelligent consumers of milk are going to force us to do better work. We must do it or go out of the business, and is it not nicer to get in front? If we are at the bottom we are like the under fellow in a foot ball game, but when we get above our neighbors we have plenty of room. There are a great many reasons why we should do this. There is a satisfaction in it. We get into a better atmosphere, we come in contact with a different class of people. It will make better men of every one of us. While it is necessary for us to make enough to get along comfortably in this life, we cannot take it away with us. I tell you, there is a great deal of satisfaction in doing high grade work. I would suggest that if you want to start in this business you should get in touch with your local physician and your Board of Health. My Board of Health is pushing me to turn my creamery in my home town into a bottling establishment, and buy milk of the patrons, run it through the separator, bottle it, chill it and deliver it in town, and I think I shall undertake it.

You will not be obliged to invest large sums of money in the infancy of your work. Do not go away with the idea that you must make new everything you have. Just put your brains to work and you can study out some way to utilize what you have. You can start in a small way, and work out your plans. You never knew a general to fight a compaign successfully unless he had planned it beforehand. Think this matter over. Talk with your family, your friends and your Board of Health, and you can work it out. I do not know what you are doing here in Augusta, but you have lots of people who would appreciate a milk in which they would not find any animal odor under any conditions. At one time a gentleman brought a lady out to my farm to convince her that it was safe for him to embark in a similar enterprise. On the way to the milk room she asked me if a person could tell my milk from other milk. I told her that the little babies that could not talk could. I told her of cases where babies had been put on to my milk when sick, and the parents had undertaken to put them back on other milk when they had recovered, and they would spit it out. When she tasted the milk she said, "If I had waited until I tasted your milk I would never have asked you that question."

Ques. Our cattle are kept in barns with wooden floors and cellars underneath where the manure is deposited. These cellars are generally well ventilated. Are these barns good for the prodction of the kind of milk you are making?

Ans. I do not believe there is any reason why they could not be utilized. The floors could be made tight so you would not get the odors from the manure. At home now I have a mason just finishing putting a cement floor on top of a wooden floor and in this way I am utilizing the second story of a barn which has horses on the first story. The second story I have used for hay, but I do not need all of the hay room and I am putting on a cement floor and putting in the same system of ventilation that I have in my other stables. It is an old frame barn with posts and girts, and the walls are such that I can have a flue. I shall build a box outside fast to the building, with the lower end about on the level of the floor, and then it will be hooded over the top where the opening is into the receiver. I do not know as it will work, but I do not see why it will not. The flue for taking the impure air out will be open at the bottom and then there will be an opening at the ceiling where we can take the hot air out if we want to. In the summer season, when the doors and windows are open, that system of ventilation does not need to work. It will work when the barn is closed so that there is need for it to work.

Ques. How deep are the gutters?

Ans. The gutters at the shallow end are six inches and at the deeper end eight inches. In some of my earlier work I did not make them that deep, but I think it is advisable. They are about sixteen inches in width.

Let me give you a point in relation to the cement floor. In finishing it do not smooth it up, especially on the walks where the cows come in. Leave it rough and then the cows will not slip on it. If you trowel it smooth the cows will slip. One of my stables is fifty by sixty feet, and the intake of air is on two opposite sides. There are three openings on each side and the air is taken out in the crevices, and I have a square foot to six or ten cows.

Ques. How do you dispose of the droppings in your barn?

Ans. They are drawn immediately into the field and spread, except for a short time in the season when I have no place to put them. Then they are drawn away and put in a pile. The manure is not allowed to accumulate. None of my barns have a basement into which the manure can be dropped. It is wheeled away on a wheelbarrow.

Ques. Is there any objection made to the milk when the cows are fed silage?

Ans. No, sir. I have had persons who knew I was feeding silage imagine they could taste it. I caught one of the leading Chicago doctors a while ago. He imagined that he could taste silage in the milk, and I was not feeding it at all. When I first went into the business I did not feed any silage to the cows from which the certified milk was produced. I knew it was all right for butter making, as I had made butter from the milk of cows fed with silage and sent it to New York in competition with butter made from dry food, and it proved to be the finer butter of the two. The first winter I had samples sent down to my family in Dekalb from the stable where we fed silage and from the stable where we were making the certified milk for Chicago, and in which we fed no silage. I presume I made 100 comparative tests that winter, of the milk from those two stables. My wife and daughter could not tell the difference between the two samples. In the large majority of cases they would select the milk from the cows fed silage as the sweeter milk. The Illinois Experiment Station did some careful work by putting out samples of milk to their customers made from silage and clover hay. They told the customers nothing except that they were two samples, and the silage won against the clover hay, and I do not know of any dry fodder that will make any better milk than clover hay. You must have the silage sound, and not allow it to lie around the cow stable when you are milking. You can contaminate the purest milk, you can load it with silage by letting it stay where the silage is. In the Pennsylvania dairy school I let a sample of milk stay a few hours with the silage and then it was brought into the lecture room and passed around the class. There was not a member of the class but could smell the silage in that milk. Keep it away from the cows until you have finished milking, and then you can feed them what you like and there is no danger at all, if the silage is sound. But you can understand that there is more danger of having decayed silage than decayed dry food because it is a moist food and after a certain length of time of exposure it will commence to decay, and then you will have trouble. There has been many a mistake with the silo from having too large a surface exposed for the number of cows you are feeding or from neglect in working the surface down finely and keeping ahead of the decay. And we have made mistakes in building cheap silos. I have made some mistakes along that line myself. A year ago last summer I had to tear out a silo that held 750 tons. It was double boarded with tarred paper between. The moisture got in between the boards and saturated the paper and it rotted both ways. I put in a circular silo, cemented inside, and I want to tell you that this is the up-to-date silo. You should have the wall as tight as a cistern wall, and if it cracks take a cement wash and fill the cracks. I go over mine every year with a pail of wash, and if there are any cracks I fill them right up.

Ques. Do you mean that you build an ordinary circular silo and then plaster it inside with cement?

Ans. I use 2x4 studding, twelve inches apart, and sheath the inside with half-inch lumber and then lathe it. with the laths cut beveled so that as you put them on you have a clinch joint to cement in, and then plaster it the same as you would a cistern, putting from one-half to five-eighths of an inch of cement outside of the laths. I think that is the nearest to a perfect silo that I know anything about. Get the best cement you can, do not get a cheap cement. I had to build over one cement floor, which cost me $500, because I knew no better than to use some cheap cement.

Ques. What effect will the frost have upon this silo?

Ans. I have seen no ill effect. I have had the silage freeze to the wall so that it would stand there for a time, and there would be a ridge of three or four feet. But when it came a little warmer weather it would drop off, and I have never been able to detect any bad result from it.

Ques. Wouldn't that silage hurt after it had been frozen?

Ans. As soon as it begins to thaw it drops down and you can mix it with the other silage and utilize it. But it is seldom that we have weather cold enough to freeze silage to the wall. We do not have as cold weather as you do, or as much of it.

Ques. Do you have hoops?

Ans. There are no hoops except wooden ones. The lumber itself is the hoop. We spring the lumber. We do not board up and down, but put all the lumber around in a circle, and every piece of lumber is a hoop of itself.

Ques. How near together is the studding?

Ans. I have twelve-inch centers and four-inch studding. All you want of the studding is to hold the material together. There is no strain on the studding, the strain is all on the outside.

Ques. Will half-inch lumber spring without breaking?

Ans. I think the half-inch stuff will spring down to a sixteen-foot circle. I have one silo thirty-eight feet in diameter from which I feed the whole herd. I can feed 250 animals safely out of a thirty-eight-foot silo, but I could not feed seventy-five or 100 out of that silo because I could not feed fast enough to keep ahead of decay. Do not have over eight feet of surface per animal, and better not more than six. If you have forty head of cattle, do not have over 250 feet of surface in your silo.

Ques. Do you find that the silage keeps better in cemented silo?

Ans. Yes, sir. To illustrate that point, I have a young man on my farm now who recently came from Pennsylvania, a very intelligent young man. I was at the farm soon after he commenced to feed silage, and I found him in the silo. He said, "Mr. Gurler, I am surprised. I took some silage from up against the wall, and there is not a bit of decayed silage here. In the wooden silos which I have seen there is a great deal of decay on the outside walls, but I do not find any on these cement walls." The cemented silos are very nearly as tight as a glass fruit jar.

Ques. Do you have doors up and down?

Ans. Yes, sir.

Ques. Do you have any drainage?

Ans. Yes, sir. With all of my silos I have a tile around the outside lower than the bottom of the silo. In one case I have three silos twenty feet in diameter in one row, and I put a tile all the way around below my buildings so that the surface water is carried away and does not get into the silo. I would not have a silo where there is any possibility of the water getting into the bottom of it.

Ques. How do you dispose of the water that comes from the corn?

Ans. We do not have any. I let my corn get so ripe that there will be no juice expelled from it. I believe it is a mistake to put corn into the silo so green that the juice will be expelled.

Ques. What kind of corn do you raise?

Ans. I raise almost everything, from the Yankee flint corn to the Virginia corn that hardly stops growing at all. This season I had 150 acres of corn drilled in, with twelve or fifteen quarts of seed to the acre, on land where we applied four loads of manure per acre, and it seemed as though the corn would never stop growing. The tail end of the Galveston storm struck it, and some of it I could not cut at all with my harvester.

Ques. Do you put all of your corn into silos?

Ans. About forty acres was shocked and I put about 1,750 tons into the silos. I will tell you what my guide is for the state of maturity at which the corn should be put in the silo. I do not want the corn to become so mature that the cows do not digest the grains, but up to that time I think there is a gain in the digestible nutrition of the corn. Prof. Haecker does not agree with me, and I do not set myself up against any trained authority, but I am simply giving you my opinion after some fifteen years of experience. We use mostly the dent corn, and I start in perhaps when half the ears are dented. There will be a few glazed and some not much out of the milk; and then I have different varieties so it will come along in about that state of maturity. I worked six weeks this fall, and finished up with the big Virginia corn.

Ques. What kind of cutters do you use?

Ans. I have used the Ross cutter, manufactured in Ohio, and the Star cutter, in Northern Illinois. For two years I have been using a cutter gotten up by the Porter Brothers, large stock dealers in Kentucky. I never saw any machine like it. It has a cylinder seven feet long with knives put on to that, like a mower. They cut against teeth in a connective, so that it gives us a clear cut. After the corn is cut into these sections, say one and one-half or two inches long, they can go down through between the connective and the cylinder until they are picked to pieces by a set of fingers. I never had so little silage rejected as since I have used that cutter.

Ques. What do you estimate it will cost per ton of capacity to build a silo?

Ans. I can build a silo at a cost of from twelve to fifteen cents per square foot of surface. That would include sheathing up on the outside with half-inch lumber, and putting a cheap roof on. If the silo was twenty feet in diameter, it would be a little over sixty feet around, and if it was twenty feet deep you would have 1,200 feet of surface and would have to reckon 1,200 times the twelve cents. It will cost you less per ton to build a silo forty feet in diameter than one twenty feet in diameter.

Ques. What is the price of your milk?

Ans. I get twelve cents a quart for the milk in Chicago, and my agents get three cents a quart for delivering and collecting.

There is a young man in Springfield, Ill., who started in the way I have advised you to start, by getting the medical profession of Springfield back of him, and while he has not worked himself up to my standard, he is getting a large milk trade in that city, and is doing very nicely. One of the members of the Wisconsin State Board of Agriculture is supplying the city of La Crosse, Wis., with milk at eight cents a quart, and delivering it himself, and is making a success of the business. There is a gentleman in Minnesota and one in Nebraska, and I do not know how many others, who are following my line of work.

Ques. What grain do you feed?

Ans. I am feeding some ground oats, some gluten meal, and some corn and cob meal.

Ques. Do you mix that with the silage?

Ans. Yes, sir. I believe it is better to feed it in that way.

PROF. GOWELL—We are doing our work very largely as you did it when you were making butter. The milk is separated at the farm by the gravity process and the cream goes to the creamery. Has that quality of work a value to us in our butter making?

Ans. If you could get your patrons to take care of their cows and milk after that high standard you would get butter that would score perfect, and you would have to set your score higher, the present standard would not answer at all. The public are becoming more critical all the while. They are not satisfied with what they have. We used to think that our mother's butter, made in June and held until winter, was just as good as any that was ever made. We were honest in our opinion, but we do not think so now.

Ques. Will you give us some method for heating water for the cows?

Ans. I will tell you how I do it, although it may not be practicable for you. I have a ten-horse steam boiler at the farm that we use for heating water for dish washing and for sterilizing all of our bottles and utensils, and we also use this for heating water for the cows. We run the water to the cows through the yard through an underground pipe. I should hardly know what to advise you to use. There are plenty of tank heaters on the market, but I am not in touch with them and do not know what is the best one. I think it is advisable to warm the water for the cows. The water which the cow takes into her stomach must be brought to the temperature of the body, and I think it is cheaper to do that with fuel than with food. Some will argue that the water is more palatable if it is not brought anywhere near up to the temperature of the cow's body. I am willing to admit this in the case of an animal that is laboring, but I do not believe it is so with the cow. The cow likes warm water. Several years ago I was at the farm one cold morning in the winter when the calves were turned out to drink. The water was started running into the tank. It was a circular tank eight feet in diameter. The calves were not satisfied with waiting for the water to reach the edge of the tank, as it would become cooled. They got right into the tank where they could get the water just as it came into it, with the steam coming from it.

Ques. Do you milk your cows up near the time of calving?

Ans. In my work I do not want a cow to be milked closer than two months. In my high grade work I cannot use the milk if I get it.

Ques. Suppose that milk is made into butter; how about the quality of the butter?

Ans. There will be a lack of flavor in the butter first, it may have too much of a wrong flavor later. One great objection to the milking of a cow close up to calving is the effect on the offspring. The calf will not amount to much, and the cow will not do as well. I question whether you get as much milk

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for the year's work as if you milked her only nine or ten months. You may for one year, but you would not for a term of years. As to the quality, you cannot make a high flavored butter from strippers unless you use a starter. You will have the solidity of Jersey butter, but you have no flavor. It is the fresh cow that puts in the flavor.

Ques. What quantity of grain per day do you feed cows giving milk?

Ans. I am feeding about ten quarts per day. Some of the larger ones get twelve quarts and some of the smaller ones six or eight. It depends some upon the amount of corn there is in the silage. I put some corn into the silo this year that would have husked out seventy-five bushels per acre. When I am feeding silage with that amount of grain in it I reduce the amount of corn meal.

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	I. Pompilly	Auburn	Geo. H. Clarke	North Anson	E. G. Eveleth	Auburn.
Eastern Maine Fair Association	F. O. Beal	Bangor	Ezra L. Sterns	Bangor	S. Dean Benson	Bangor.
Maine State Pomological	Z. A. Gilbert	North Greene	D. H. Knowlton	Farmington	Chas. S. Pope	Manchester.
Androscoggin County	J. L. Cummings	Livermore Falls	J. L. Lowell	Auburn	Edwin Riley	Livermore Falls.
Androscoggin, Durham	Rufus Parker	Durham	J. H. Williams	Durham	S. B. Libby	Durham.
Aroostook County	E. L. Cleaveland	Houlton	Geo. T. Holyoke	Houlton	Geo. Q. Nickerson	Houlton.
Aroostook, North	J. W. Dudley	Mapleton	E. T. McGlauflin	So. Presque Isle	A. E. Irving	Presque Isle.
Aroostook, South	T. B. Bradford	Golden Ridge	Isaac Cushman	Sherman Mills	B. H. Towle	Sherman Mills.
Aroostook, Madawaska	E. E. Etenaud	St. David	Remi A. Daigle	St. David	Vilas Cyr	St. David.
Cumberland County	C. W. Deering	Gorham	C. H. Leigton	Westbrook	F. D. Scammon	Gorham.
Cumberland, North	Q. M. Chute	Harrison	J. Orin Ross	Harrison	Geo. P. Carsley	Harrison.
Cumberland Farmer's Club	M. W. Pearson	Cumberland Cen.	H. B. Clough	Cumberland Cen	N. M. Shaw.	West Cumberland.
Cumberland Gray Park Association	B. F. Skillings	Gray	J. W. Stevens	Gray	J. W. Stevens	Gray.
Cumberland, Bridgton Farmers' and Mechanics' Association	I. S. Webb	Bridgton	J. S. Ames	Bridgton	F. A. Webb	Bridgton.
Cumberland, New Gloucester and Danville	S. F. Sweetsir	New Gloucester	M. F. Nevens	Upper Gloucester	Geo. C. Jordan	Upper Gloucester.
Cumberland, Lake View Park	Arthur Dyer	East Sebago	A. L. Brackett	East Sebago	J. P. Fitch	East Sebago.
Franklin County	J. H. Crowell	Farmington	A. F. Gammon	Farmington	Geo. M. Currier	Farmington.
Franklin, North	D. D. Graffam	Phillips	M. S. Kelley	Phillips	S. H. Beal	Phillips.
Hancock County	W. J. Creamer	Penobscot	Nahum Hinckley	Bluehill	M. P. Hinckley	Bluehill.
Hancock, North	H. T. Silsby	Aurora	A. W. Silsby	Amherst	A. W. Silsby	Amherst.
Hancock County Fair Association	H. E. Davis	Ellsworth	H. F. Whitcomb	Ellsworth	H. J. Joy	Ellsworth.
Hancock, Eden	S. G. Hall	Eden	F. A. Wood	Salisbury Cove	J. E. Hamor	West Eden.
Kennebec County	E. H. Kent	Fayette	W. G. Hunton	Readfield	C. H. Stevens	Readfield.
Kennebec, South	C. F. Achorn	Cooper's Mills	A. N. Douglass	Chelsea	J. S. Gray	South Windsor.
Kennebec, Pittston Agricultural and Trotting Park Association	John H. Bailey	East Pittston	D. C. Knight	East Pittston	W. E. Seekins	East Pittston.
Knox, North	E. E. Thurston	Union	Geo. C. Hawes	Union	H. W. Grinnell	Union.
Lincoln County	A. M. Card	Headtide	B. A. Woodbridge	North Newcastle	John E. Nelson	Alna.
Lincoln, Bristol	G. A. Hustin	Damariscotta	R. H. Woodward	Damariscotta	C. B. Woodward	Damariscotta.
Oxford County	Wm. J. Wheeler	South Paris	A. C. T. King	South Paris	A. C. T. King	South Paris.
Oxford, Riverside Park Association	C. M. Wormell	Bethel	Wm. E. Abbott	Bethel	E. C. Rowe	Bethel.
Oxford, West	D. A. Ballard	West Fryeburg	T. L. Eastman	Fryeburg	W. R. Tarbox	Fryeburg.
Oxford, Androscoggin Valley	J. W. Thompson	Canton	E. W. Howe	Canton	D. W. Goding	East Peru.
Oxford, North	O. B. Poor	Andover	J. F. Talbot	Andover	A. L. Melcher	Andover.
Penobscot County	Charles Sutton	Stillwater	Geo. N. Holland	Hampden	H. W. Hammond	Hampden.
Penobscot, Lee Union	E. C. House	Lee	Nathan Averill	Lee	Mrs. Belle Brean	Lee.

Penobscot, West	B. P. Hubbard	Stetson	F. E. Jewett	Exeter	F. E. Jewett	Exeter.
Penobscot, North	S. T. Mallett	South Springfield	B. D. Averill	Prentiss	E. A. Reed	North Lee.
Penobscot, East Eddington Farmers' Club	A. H. Pond	East Eddington	Boyden Bearce	East Eddington	J. H. Comins	East Eddington.
Penobscot, Orrington	A. G. Dole	South Brewer	N. A. Nickerson	Orrington	N. A. Nickerson	Orrington.
Piscataquis, East	W. H. Snow	Milo	A. L. Ward	Milo	A. L. Ward	Milo.
Sagadahoc County	B. M. Patten	Topsham	W. S. Rogers	Cathance	L. E. Smith	Brunswick.
Sagadahoc, Richmond Farmers' and Mechanics' Club	F. J. Libby	Richmond	C. E. Dinslow	Richmond Corner	D. W. Alexander	Richmond.
Somerset County	Orlando Walker	Anson	J. F. Withee	Madison	C. A. Wilbur	Madison.
Somerset, Central	S. W. Gould	Skowhegan	R. T. Patten	Skowhegan	E. D. Packard	Skowhegan.
Waldo County	S L. Pitcher	Belfast	B. H. Conant	Belfast	G. G. Abbott	Belfast.
Waldo and Penobscot	M. C. Chapman	Newburgh Vil	F. H. Bowden	Monroe	F. L. Palmer	Monroe.
Waldo, North	Edwin Rand	Unity	E. B. Hunt	Unity	F. A. Bartlett	Unity.
Washington County	G. W. Allan	West Pembroke	J. C. Wright	Pembroke	Clifton Laughlin	Pembroke.
Washington, North	C. H. Yates	Princeton	A. L. Jones	Princeton	N. Ripley	Princeton.
Washington, West	B. F. Willey	Cherryfield	E. F. Allen	Columbia Falls	F. L. Allen	Columbia Falls.
York, Ramshackle Park	W. H. Straw	Newfield	G. T. Wilson	Newfield	A. J. Shepherd	West Newfield.
York, Shapleigh and Acton	G. W. Grant	Acton	F. K. Bodwell	Acton	W. P. Ferguson	Springvale.
York, Ossipee Valley Union	R. G. Pease	Cornish	H. L. Merrill	East Parsonsfield	O. B. Churchill	North Parsonsfield.
York, North Berwick	Nathaniel Hobbs	North Berwick	C. F. Goodwin	North Berwick	John B. Russell	North Berwick.

ANALYSIS OF EXHIBITION.

Name of Society.	Number of horses and colts.	Number of thoroughbred bulls and bull calves.	Number of thoroughbred cows, heifers and heifer calves.	Number of grade bulls and bull calves.	Number of grade cows, heifers and heifer calves.	Number of oxen and steers.	Number of animals for beef.	Number of cattle shown in herds.	Total number of neat stock.	Number of sheep.	Number of swine.	Number of poultry. (coops).
Androscoggin County	68	26	60	-	74	80	22	65	240	10	18	140
Androscoggin, Durham	20	2	2	5	17	18	6	8	58	16	23	17
Aroostook County	61	13	26	-	9	-	-	8	56	34	6	20
Aroostook, North	139	16	18	10	54	14	-	18	130	93	5	10
Aroostook, South	5	-	-	1	-	2	-	-	3	6	-	2
Aroostook, Madawaska	35	-	-	6	4	10	-	-	20	18	-	-
Cumberland County	37	19	23	-	48	124	18	30	262	35	45	16
Cumberland, North	24	-	-	7	55	56	2	38	158	7	15	19
Cumberland Farmers' Club	8	11	23	-	45	40	11	24	154	5	40	60
Cumberland Gray Park Association	50	7	18	1	14	70	4	15	129	15	9	22
Cumberland, Bridgton Farmers' and Mechanics' Asso.	38	15	25	2	25	92	6	8	173	16	11	51
Cumberland, New Gloucester and Danville	38	4	8	5	46	24	-	20	87	2	4	50
Cumberland, Lake View Park	7	2	1	-	7	8	2	-	20	-	-	2
Franklin County	111	31	57	25	150	340	18	109	730	250	9	68
Franklin, North	59	11	28	6	61	84	7	54	251	91	16	36
Hancock County	4	3	-	3	40	41	4	-	91	14	9	9
Hancock, North	21	-	1	5	16	10	-	-	32	4	-	4
Hancock County Fair Association	23	11	14	-	37	20	-	-	82	10	8	34
Hancock, Eden	3	4	7	1	12	-	8	-	32	-	-	-
Kennebec County	49	18	31	-	67	82	27	48	273	34	44	75
Kennebec, South	34	8	23	10	31	144	10	25	251	23	10	3
Kennebec, Pittston Agricultural & Trotting Park Asso.	18	1	7	6	21	44	6	23	108	13	1	52
Knox, North	36	8	13	3	37	74	8	25	143	30	14	42
Lincoln County	28	4	19	2	10	91	3	22	151	60	29	53
Lincoln, Bristol	23	-	-	-	13	40	-	-	53	18	-	13

Oxford County	39	33	56	-	107	82	8	36	322	135	76	9
Oxford, Riverside Park Association	55	15	43	12	52	40	10	38	176	65	27	10
Oxford, West	66	11	36	1	14	128	17	36	243	11	22	42
Oxford, Androscoggin Valley	44	17	27	5	40	144	3	10	246	2	19	4
Oxford, North	15	7	15	1	10	42	2	18	95	31	18	20
Penobscot County	8	1	1	-	-	-	-	-	2	-	-	-
Penobscot, Lee Union	12	3	4	5	22	14	1	-	49	6	6	4
Penobscot, West	62	28	75	6	71	64	2	30	276	67	28	26
Penobscot, North	22	1	2	3	9	9	10	24	58	14	6	8
Penobscot, East Eddington Farmers' Club	15	1	1	3	20	-	-	12	37	23	-	10
Penobscot, Orrington	16	-	-	1	4	-	-	6	11	9	1	52
Sagadahoc County	32	31	99	1	142	152	2	-	427	46	50	233
Sagadahoc, Richmond Farmers' and Mechanics' Club	12	3	28	-	54	10	2	75	97	-	7	96
Somerset County	18	8	12	2	66	56	6	-	150	113	2	13
Somerset, Central	75	7	16	-	50	48	10	-	131	6	25	29
Waldo County	13	-	2	-	7	4	-	-	13	6	-	3
Waldo and Penobscot	42	18	35	4	31	60	13	70	231	74	4	18
Waldo, North	31	3	3	7	30	28	-	-	71	42	5	1
Washington County	49	5	21	-	44	18	-	-	88	64	22	34
Washington, North	10	-	-	-	4	2	-	-	6	3	-	-
Washington, West	39	8	6	-	26	28	-	6	74	57	8	45
York, Ramshackle Park	18	-	2	-	26	36	6	-	70	-	-	-
York, Shapleigh and Acton	7	-	-	5	15	100	8	-	128	9	2	32
York, Ossipee Valley Union	17	7	15	-	24	154	2	12	214	20	8	8
York, North Berwick Agricultural Association	35	6	15	4	20	50	-	-	95	-	-	-

ANALYSIS OF AWARDS.

Name of Society.	Amount of premiums paid trotting bred stallions.	Amount of premiums paid trotting bred, brood mares.	Amount of premiums paid draft stock stallions	Amount of premiums paid draft stock brood mares.	Amount of premiums paid family horses.	Amount of premiums paid gentlemen's drivers.	Amount of premiums paid matched carriage horses.	Amount of premiums paid colts.	Amount of premiums paid horses for draft.
Androscoggin County	$22 00	$9 00	$10 00	$10 00	$9 00	$10 00	$12 00	$54 00	$27 00
Androscoggin, Durham	-	3 00	-	-	3 00	3 00	-	12 00	9 00
Aroostook County	8 50	4 50	9 00	4 50	3 50	4 50	3 00	26 00	6 00
Aroostook, North	-	4 50	4 50	4 50	-	3 25	-	32 50	16 00
Aroostook, South	-	50	-	-	-	50	-	50	-
Aroostook, Madawaska	1 25	1 50	-	-	-	-	1 50	3 50	3 75
Cumberland County	12 00	13 00	-	-	12 00	-	-	10 00	36 00
Cumberland, North	3 00	-	-	5 00	-	-	5 00	9 00	51 00
Cumberland Farmers' Club	-	3 00	-	-	-	10 00	-	6 50	2 00
Cumberland, Gray Park Association	4 00	9 50	-	2 00	5 00	15 00	5 00	6 00	-
Cumberland, Bridgton Farmers' and Mechanics' Association	6 00	4 00	-	3 00	7 00	-	13 00	15 00	27 00
Cumberland, New Gloucester and Danville	8 00	-	5 00	-	3 00	8 00	3 00	10 00	5 00
Cumberland, Lake View Park	4 00	2 00	2 00	-	-	-	-	5 00	13 00
Franklin County	26 50	6 00	2 00	3 00	20 00	-	16 00	22 75	25 00
Franklin, North	4 50	8 50	6 00	4 00	10 00	7 00	5 00	15 00	5 00
Hancock County	8 00	-	-	6 00	-	2 00	-	11 00	-
Hancock, North	2 75	-	-	-	1 25	2 50	-	1 50	28 00
Hancock County Fair Association	22 00	20 00	-	-	-	10 00	-	-	28 00
Hancock, Eden	-	1 50	-	-	-	-	-	1 50	-
Kennebec County	16 00	16 00	14 00	-	9 00	9 00	6 00	18 00	18 00
Kennebec, South	10 50	3 75	-	-	-	3 50	-	8 00	15 75
Kennebec, Pittston Agricultural and Trotting Park Association	-	-	-	3 00	2 00	2 00	-	8 00	-
Knox, North	5 00	3 00	-	-	3 00	2 50	3 50	8 50	31 00
Lincoln County	8 00	3 00	3 00	2 00	3 00	-	7 00	4 75	17 00
Lincoln, Bristol	-	-	-	-	-	-	-	-	6 00
Oxford County	23 00	27 00	-	-	18 00	35 00	24 00	42 00	65 00
Oxford, Riverside Park Association	6 00	6 00	-	23 00	-	-	-	15 00	38 00
Oxford, West	15 00	7 00	7 00	9 00	7 00	25 00	9 00	12 00	44 00
Oxford, Androscoggin Valley	7 00	6 00	-	-	-	9 00	4 00	13 60	11 00

Oxford, North	4 50	-	3 00	3 00	-	-	-	10 20	33 00
Penobscot County	-	3 00	-	3 00	3 00	3 00	-	5 50	-
Penobscot, Lee Union	-	-	-	1 75	-	-	-	-	1 50
Penobscot, West	3 00	9 00	-	-	6 00	6 00	7 00	14 50	18 00
Penobscot, North	-	2 50	3 00	2 50	-	2 50	1 50	8 75	5 25
Penobscot, East Eddington Farmers' Club	-	-	-	2 25	-	2 50	-	1 00	7 00
Penobscot, Orrington	-	2 00	-	-	-	5 00	-	1 75	8 00
Sagadahoc County	15 00	23 00	-	-	-	15 00	34 00	-	-
Sagadahoc, Richmond Farmers' and Mechanics' Club	2 00	75	-	-	2 00	-	-	1 10	2 00
Somerset County	-	3 00	-	-	3 50	-	-	7 50	11 00
Somerset, Central	8 00	6 00	2 00	4 50	-	4 50	-	13 50	11 00
Waldo County	2 00	3 00	-	-	-	-	-	8 00	3 00
Waldo and Penobscot	36 00	-	-	-	18 00	18 00	14 00	32 00	30 00
Waldo, North	15 00	3 00	-	6 00	4 50	6 00	-	19 00	-
Washington County	5 00	12 00	-	9 00	-	-	9 00	24 00	9 00
Washington, North	-	2 00	-	3 00	-	-	-	7 00	2 00
Washington, West	16 00	9 00	-	4 00	5 00	65 00	-	30 00	52 00
York, Ramshackle Park	8 00	8 00	-	-	9 00	14 00	4 00	20 00	4 00
York, Shapleigh and Acton	-	-	-	-	6 00	5 00	-	-	-
York, Ossipee Valley Union	10 00	6 00	-	-	-	6 00	6 00	25 00	15 00

ANALYSIS OF AWARDS—Continued.

Name of Society.	Amount of premiums paid thoroughbred bulls and bull calves.	Amount of premiums paid thoroughbred cows, heifers and heifer calves.	Amount of premiums paid grade bulls and bull calves.	Amount of premiums paid grade cows, heifers and heifer calves.	Amount of premiums paid herds.	Amount of premiums paid working oxen and steers.	Amount of premiums paid matched oxen and steers.	Amount of premiums paid trained steers.	Amount of premiums paid beef cattle.	Amount of premiums paid town teams.	Amount of premiums paid oxen and steers for draft.
Androscoggin County	$96 00	$90 00	-	$108 00	$20 00	$7 00	$35 00	$9 00	$16 00	$84 00	$65 00
Androscoggin, Durham	9 50	13 50	$5 75	19 00	6 00	-	6 00	12 00	6 00	-	18 00
Aroostook County	20 00	30 00	-	9 00	8 00	-	-	-	-	-	-
Aroostook, North	37 50	42 00	8 75	21 25	11 00	-	16 50	-	-	-	-
Aroostook, South	-	-	50	30	-	40	-	-	-	-	-
Aroostook, Madawaska	75	-	3 75	5 25	-	1 25	-	-	-	-	-
Cumberland County	23 00	24 00	-	30 00	24 00	42 00	27 00	12 00	32 00	16 00	81 00
Cumberland, North	-	-	15 00	7 50	31 00	6 00	17 50	8 50	3 00	15 00	48 00
Cumberland Farmers' Club	27 50	26 00	-	23 00	33 00	21 00	23 00	-	9 00	30 00	16 00
Cumberland, Gray Park Association	7 50	13 00	3 00	22 00	6 00	5 00	10 00	28 00	5 00	33 00	8 00
Cumberland, Bridgton Farmers' and Mechanics' Asso	44 00	59 00	-	31 75	6 00	9 00	42 50	6 00	11 50	24 00	62 00
Cumberland, New Gloucester and Danville	9 00	16 00	6 00	38 00	15 00	6 00	7 50	-	-	10 00	-
Cumberland, Lake View Park	4 00	2 00	2 00	8 00	-	4 00	-	-	2 00	-	-
Franklin County	54 25	65 50	27 75	64 00	42 00	16 00	45 00	3 50	17 50	77 00	40 00
Franklin, North	9 25	22 80	4 75	16 65	10 00	3 50	9 65	1 50	4 50	25 00	5 00
Hancock County	20 00	-	3 00	44 75	-	25 00	-	-	7 50	-	18 00
Hancock, North	-	50	3 25	10 75	-	5 75	-	-	-	-	-
Hancock County Fair Association	29 25	34 50	-	43 75	-	40 00	-	7 00	-	-	33 00
Hancock, Eden	6 50	11 75	2 00	2 75	3 00	-	-	-	-	-	-
Kennebec County	22 50	34 50	-	42 00	24 00	39 50	18 00	10 00	20 00	74 00	-
Kennebec, South	16 00	35 25	16 75	21 00	19 50	18 25	25 00	1 25	3 50	50 00	22 25
Kennebec, Pittston Agricultural and Trotting Park Asso.	2 00	6 50	-	11 00	4 00	9 50	12 00	-	6 00	35 00	33 50
Knox, North	8 75	11 00	2 50	25 50	9 00	9 75	9 00	-	6 00	12 00	16 00
Lincoln County	9 00	25 50	2 00	9 00	7 00	10 75	21 00	2 00	6 00	24 00	42 00
Lincoln, Bristol	-	-	-	7 50	-	-	-	-	-	-	7 00

Oxford County	135 00	155 00	-	178 00	36 00	140 00	50 00	-	12 00	85 00	59 00
Oxford, Riverside Park Association	104 00	85 00	8 00	50 00	8 00	38 50	10 00	5 00	-	24 00	48 00
Oxford, West	26 00	72 00	3 00	23 50	16 00	18 00	32 50	9 00	16 50	74 00	76 00
Oxford, Androscoggin Valley	28 00	35 00	4 00	15 50	12 00	26 00	27 00	6 00	3 00	20 00	29 00
Oxford, North	11 00	12 25	2 00	6 90	10 00	5 00	7 50	3 75	2 50	5 00	5 00
Penobscot County	-	-	-	-	-	-	-	-	-	-	-
Penobscot, Lee Union	3 50	8 75	3 75	7 50	-	5 25	-	-	-	-	-
Penobscot, West	65 00	109 00	15 50	65 75	38 00	46 00	19 00	11 00	8 00	-	-
Penobscot, North	1 50	3 50	5 00	18 50	-	5 25	-	-	-	-	4 45
Penobscot, East Eddington Farmers' Club	2 00	1 00	1 75	8 00	9 00	-	-	-	-	-	-
Penobscot, Orrington	-	-	1 00	3 50	4 00	-	-	-	-	8 00	-
Sagadahoc County	94 50	162 75	-	133 25	50 00	48 50	26 00	9 00	5 00	54 00	51 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	1 70	5 60	-	8 25	5 75	80	1 40	50	60	-	-
Somerset County	8 50	8 00	2 00	39 00	-	10 00	7 50	1 00	2 50	19 00	13 00
Somerset, Central	8 00	17 50	-	41 00	-	18 50	-	-	11 00	17 00	15 00
Waldo County	-	2 00	-	12 50	-	5 00	-	-	-	-	-
Waldo and Penobscot	76 00	148 00	10 00	108 00	52 00	18 00	43 00	12 00	34 00	-	37 00
Waldo, North	7 00	3 00	18 00	23 75	-	21 00	14 50	-	-	-	-
Washington County	11 50	18 50	-	24 00	32 00	18 00	-	-	-	-	-
Washington, North	-	-	-	7 50	-	-	1 50	-	-	-	-
Washington, West	51 00	25 00	-	56 00	6 00	62 00	-	10 00	-	-	-
York, Ramshackle Park	-	7 00	-	46 00	-	30 00	24 50	6 00	9 00	10 00	19 00
York, Shapleigh and Acton	-	-	5 50	13 00	-	12 00	24 50	-	6 00	45 00	12 00
York, Ossipee Valley Union	12 00	40 00	-	35 00	12 00	15 00	12 00	13 00	10 00	25 00	50 00
York, North Berwick Agricultural Association	5 00	10 00	4 00	10 00	-	-	15 00	-	-	20 00	10 00

ANALYSIS OF AWARDS—Concluded.

Name of Society.	Amount of premiums paid sheep.	Amount of premiums paid swine.	Amount of premiums paid poultry.	Amount of premiums paid grain and root crops.	Amount of premiums paid fruit and flowers.	Amount of premiums paid bread and dairy products.	Amount of premiums paid honey, sugar and syrups.	Amount of premiums paid agricultural implements.	Amount of premiums paid household manufactures and needle work.	Amount of premiums paid objects not named above.	Total amount of premiums and gratuities paid.
Androscoggin County	$12 00	$24 00	$96 00	$104 00	$77 00	$34 00	$13 00	$5 00	$96 00	$233 06	$1,387 00
Androscoggin, Durham	13 00	6 50	10 50	27 10	17 00	4 55	7 90	-	23 75	10 50	246 55
Aroostook County	34 50	12 50	17 25	17 10	13 75	5 00	-	-	11 20	7 25	255 05
Aroostook, North	24 75	5 00	17 00	66 70	54 40	14 50	2 75	2 00	27 30	85 08	501 73
Aroostook, South	3 90	-	-	5 30	1 00	1 80	-	-	5 60	-	20 30
Aroostook, Madawaska	5 75	-	-	13 95	-	-	-	-	10 50	4 65	57 35
Cumberland County	17 00	12 00	24 00	42 00	20 00	32 00	-	-	34 00	41 75	616 75
Cumberland, North	3 00	9 00	24 75	15 75	13 25	14 75	1 75	-	28 05	2 00	336 80
Cumberland Farmers' Club	3 00	6 00	97 85	30 75	24 00	14 50	-	-	21 50	4 75	432 35
Cumberland, Gray Park Association	7 00	2 00	13 25	8 00	7 00	5 50	3 30	-	19 80	41 50	294 35
Cumberland, Bridgton Farmers' and Mechanics' Association	18 00	13 00	27 00	43 75	-	9 50	-	7 25	24 00	12 00	525 25
Cumberland, New Gloucester and Danville	2 00	9 00	22 60	13 40	17 50	5 50	2 50	-	24 40	6 65	253 05
Cumberland, Lake View Park	-	-	75	8 00	7 55	1 50	-	-	6 40	-	72 20
Franklin County	129 25	10 50	85 00	20 00	44 30	9 60	4 35	2 75	57 90	42 60	980 00
Franklin, North	26 80	4 00	14 15	13 00	12 30	4 00	6 05	-	25 10	-	283 00
Hancock County	14 00	4 00	7 50	46 65	26 90	7 15	3 25	-	25 75	15 75	296 20
Hancock, North	-	-	1 50	29 95	18 20	6 90	1 10	-	30 20	11 00	155 10
Hancock County Fair Association	20 00	10 50	29 25	58 50	43 25	21 20	5 50	-	52 60	28 00	536 30
Hancock, Eden	1 00	2 00	5 20	29 70	8 20	50	-	-	10 80	2 85	89 25
Kennebec County	28 00	18 00	36 00	-	84 50	37 50	10 25	-	87 00	28 90	720 65
Kennebec, South	15 00	3 00	2 25	14 90	26 25	14 85	1 00	-	56 05	-	403 55
Kennebec, Pittston Agricultural and Trotting Park Association	6 50	1 50	11 50	22 00	25 00	1 50	2 75	-	15 70	60	221 55
Knox, North	11 75	3 00	18 45	18 25	22 70	7 25	8 00	-	17 40	23 70	296 50

Lincoln County	9 00	5 00	32 00	46 25	25 00	10 75	4 00	1 25	20 30	6 25	365 80
Lincoln, Bristol	5 00	–	11 25	22 25	7 50	3 00	75	–	31 10	3 00	104 35
Oxford County	87 00	44 00	3 00	46 25	41 00	56 25	6 50	8 00	37 40	206 05	1,619 45
Oxford, Riverside Park Association	15 00	12 00	4 50	11 00	25 00	8 00	–	–	–	43 75	587 75
Oxford, West	7 00	22 00	42 50	52 25	–	31 65	11 25	1 00	34 05	23 50	726 70
Oxford, Androscoggin Valley	4 00	3 00	2 00	13 70	21 35	8 75	3 50	5 00	28 85	18 00	364 25
Oxford, North	16 00	8 00	10 00	12 75	7 85	6 75	4 50	5 00	15 00	10 00	220 45
Penobscot County	–	–	–	–	–	–	–	–	–	–	17 50
Penobscot, Lee Union	1 00	1 00	2 50	1 75	4 00	1 25	50	–	6 25	–	50 25
Penobscot, West	21 50	13 00	9 25	16 15	36 65	15 25	1 90	–	95 10	35 10	684 65
Penobscot, North	4 75	3 00	5 00	4 10	6 00	2 00	2 75	–	21 10	–	112 90
Penobscot, East Eddington Farmers' Club	6 25	–	3 25	25 00	16 30	3 00	–	–	11 40	8 00	107 70
Penobscot, Orrington	3 00	1 00	20 25	16 80	24 45	3 65	1 50	–	27 25	8 00	139 15
Sagadahoc County	23 00	21 00	116 00	111 75	108 50	47 00	18 25	–	79 25	269 77	1,515 52
Sagadahoc, Richmond Farmers' and Mechanics' Club	–	40	10 30	10 25	6 60	3 40	25	–	8 30	3 70	75 65
Somerset County	33 75	1 25	6 00	6 85	2 40	2 00	–	–	5 35	5 90	199 00
Somerset, Central	2 00	9 00	26 75	11 75	11 75	2 00	5 00	–	10 50	–	256 25
Waldo County	3 00	–	6 00	4 00	8 00	2 00	–	–	31 25	17 50	107 25
Waldo and Penobscot	65 00	13 00	15 00	41 25	49 00	41 50	1 50	–	107 25	61 40	1,080 90
Waldo, North	31 50	5 75	75	24 25	18 75	14 50	23 00	–	32 75	7 75	299 75
Washington County	39 00	15 00	26 00	73 50	28 75	26 15	1 00	–	57 70	4 00	443 10
Washington, North	2 75	–	–	14 50	10 50	4 25	–	–	19 70	–	74 70
Washington, West	79 00	8 00	37 50	160 75	63 00	22 25	4 25	–	98 85	25 50	890 10
York, Ramshackle Park	–	–	5 25	14 00	5 70	4 50	1 25	–	27 50	10 00	286 70
York, Shapleigh and Acton	5 00	1 75	21 75	55 00	35 00	15 50	5 00	–	25 00	70 50	363 50
York, Ossipee Valley Union	9 00	9 00	8 50	14 80	–	–	37 00	–	–	15 00	385 30
York, North Berwick Agricultural Association	10 00	8 00	9 50	15 00	5 00	5 00	–	–	47 50	22 50	196 50

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.	Amount expended in improvements.	Amount expended in trotting purses.	Expenses during the fair.	Amount expended for all other purposes.	Total amount paid out including premiums and gratuities.	Value of property belonging to the society.	Amount of liabilities.
Androscoggin County	$475 00	$60 00	$500 00	$340 00	$1,536 86	$2,911 86	-	$750 00	$686 40	$47 25	$2,870 65	$600 00	$1,200 00
Androscoggin, Durham	84 24	-	-	110 00	548 90	743 14	$55 00	337 25	55 00	100 00	793 80	2,000 00	1,500 00
Aroostook County	-	71 00	-	425 00	1,546 95	2,042 95	83 20	970 00	521 94	462 76	2,292 95	-	250 00
Aroostook, North	153 92	76 80	-	330 00	1,709 78	2,270 50	75 00	800 00	175 00	718 77	2,270 50	4,000 00	2,600 00
Aroostook, South	5 00	6 00	-	-	11 05	22 65	-	-	-	1 73	22 03	-	-
Aroostook, Madawaska	20 54	27 00	-	-	-	47 54	-	-	1 00	-	58 35	-	-
Cumberland County	289 87	20 00	135 35	546 25	3,103 37	4,094 84	418 56	1,385 00	1,267 35	356 10	4,043 76	4,000 00	1,110 35
Cumberland, North	115 91	50 00	-	62 00	284 69	512 60	40 00	175 00	70 00	-	621 80	2,500 00	107 20
Cumberland Farmers' Club	127 34	18 00	-	180 00	955 04	1,280 38	142 00	425 00	26 00	227 25	1,252 60	3,000 00	300 00
Cumberland, Gray Park Association	104 27	-	-	207 50	1,057 16	1,368 93	140 33	515 00	208 62	171 63	1,329 93	9,000 00	225 00
Cumberland, Bridgton Farmers' and Mechanics' Association	175 24	10 00	-	190 00	1,312 62	1,687 86	120 00	725 00	245 46	202 41	1,818 12	2,500 00	-
Cumberland, New Gloucester and Danville	75 12	-	-	116 00	701 88	893 00	18 21	290 00	134 19	114 14	809 59	2,500 00	-
Cumberland, Lake View Park	39 71	-	-	50 00	255 95	345 66	-	205 00	55 00	-	332 20	900 00	96 00
Franklin County	355 01	689 00	-	452 50	2,433 27	3,929 78	276 32	1,127 50	912 41	237 00	3,533 23	10,000 00	-
Franklin, North	88 28	288 00	100 00	102 00	964 03	1,542 31	250 00	355 50	250 50	396 43	1,535 43	3,706 88	2,220 00
Hancock County	129 79	-	-	44 00	1,062 66	1,236 45	50 00	233 00	232 39	80 10	891 69	5,000 00	300 00
Hancock, North	53 23	2 00	4 10	-	448 32	507 65	10 03	-	264 43	78 09	507 65	150 00	4 10
Hancock County Fair Association	191 90	-	-	140 00	2,435 35	2,767 25	223 20	635 00	1,329 50	579 55	3,303 55	11,500 00	410 00
Hancock, Eden	25 33	13 50	-	-	819 78	858 61	519 66	-	80 91	170 49	860 31	1,200 00	425 00
Kennebec County	298 84	2 00	500 00	115 00	1,218 28	2,134 12	600 00	460 00	375 00	95 00	2,250 65	4,000 00	1,450 00
Kennebec, South	144 06	-	-	63 50	1,657 15	1,864 71	17 43	375 00	254 13	769 05	1,819 16	2,400 00	-
Kennebec, Pittston Agricultural and Trotting Park Association	89 34	-	-	54 00	1,368 03	1,511 37	100 00	280 60	100 00	809 12	1,511 27	1,500 00	600 00
Knox, North	116 57	331 50	-	66 00	950 68	1,464 75	25 00	290 00	581 25	267 00	1,459 75	-	-

Lincoln County	133 85	25 00	–	162 00	1,457 18	1,778 03	335 65	400 00	285 16	290 03	1,676 64	2,500 00	200 00
Lincoln, Bristol	38 36	9 75	–	–	373 45	421 56	65 98	–	121 22	94 20	385 75	1,000 00	75 00
Oxford County	652 89	24 00	127 42	335 00	4,163 00	5,302 31	617 24	893 75	354 31	2,524 29	6,009 04	10,000 00	127 42
Oxford, Riverside Park Association	–	–	–	215 00	590 71	805 71	125 00	500 00	350 00	100 00	1,662 75	2,400 00	560 00
Oxford, West	275 98	63 00	–	390 00	2,297 62	3,026 60	525 00	850 00	354 50	427 36	2,883 56	8,325 00	1,000 00
Oxford, Androscoggin Valley	172 70	16 00	–	572 50	2,464 46	3,225 66	327 01	1,275 00	309 34	628 75	2,904 35	2,500 00	2,400 00
Oxford, North	95 52	5 00	50 25	122 50	611 22	884 49	–	347 50	42 00	265 00	874 95	3,000 00	–
Penobscot County	–	–	–	4 00	50 18	54 18	–	–	53 73	11 58	82 81	–	24 55
Penobscot, Lee Union	–	–	–	–	42 25	42 25	–	–	13 50	–	63 75	–	21 50
Penobscot, West	203 88	72 00	–	375 75	1,630 52	2,282 15	260 00	837 50	500 00	–	2,282 15	6,000 00	3,500 00
Penobscot, North	42 58	–	–	–	112 90	155 48	10 00	–	20 00	15 00	157 90	–	–
Penobscot, East Eddington Farmers' Club	43 92	–	–	–	321 04	364 96	42 87	–	83 26	4 00	237 83	1,500 00	–
Penobscot, Orrington	46 65	–	–	45 75	436 94	529 34	30 00	189 75	78 25	79 10	516 25	1,100 00	200 00
Sagadahoc County	543 28	457 00	1,850 00	447 50	3,993 72	7,291 50	2,000 00	1,065 00	2,112 08	598 90	7,291 50	7,000 00	2,700 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	38 23	–	–	–	134 69	172 92	5 15	–	20 25	34 76	135 81	50 00	3 00
Somerset County	72 43	–	–	85 00	651 86	809 29	–	225 00	101 62	262 60	788 22	1,150 00	68 00
Somerset, Central	–	–	–	150 00	1,042 54	1,192 54	100 00	437 50	725 20	–	1,518 95	2,500 00	500 00
Waldo County	–	170 00	–	137 50	753 57	1,061 07	289 55	336 00	135 46	56 61	924 87	3,500 00	–
Waldo and Penobscot	250 00	100 00	31 35	531 75	2,954 04	3,867 14	411 95	1,215 00	966 48	102 18	3,776 51	3,000 00	–
Waldo, North	105 08	20 00	–	50 00	662 00	837 08	–	425 00	196 25	–	921 00	–	83 92
Washington County	168 66	8 00	–	192 50	1,021 66	1,390 82	55 00	517 50	190 02	72 80	1,278 42	1,700 00	1,000 00
Washington, North	44 43	–	–	122 00	413 44	579 87	–	310 00	89 00	61 80	535 50	3,000 00	2,000 00
Washington, West	334 08	2 00	–	300 00	3,045 75	3,681 83	85 50	1,050 00	759 00	962 14	3,746 74	2,232 00	996 00
York, Ramshackle Park	–	154 00	–	100 00	371 15	625 15	–	430 00	94 62	–	811 32	2,000 00	186 17
York, Shapleigh and Acton	136 90	209 00	60 00	–	19 30	425 20	–	–	18 00	20 25	401 75	2,000 00	–
York, Ossipee Valley Union	200 00	–	–	260 00	1,701 60	2,161 60	22 33	775 00	172 10	806 87	2,161 60	6,500 00	1,415 27
York, North Berwick Agricultural Association	186 84	–	–	171 90	873 62	1,232 36	–	558 00	895 59	121 19	1,771 28	8,000 00	5,475 00

MAINE BOARD OF AGRICULTURE.

ANNUAL MEETING, 1901.

The annual meeting of the Maine Board of Agriculture was held at the rooms of the Board, State House, Augusta, January 16 and 17, 1901.

WEDNESDAY, JANUARY 16—FORENOON.

The meeting was called to order by the President, John M. Winslow of Nobleboro. A committee on credentials was appointed by the Chair as follows: J. F. Buker of Sagadahoc county, S. H. Garvin of York county and Joseph Ellis of Waldo county. This committee, after examining the credentials presented to them, reported that E. E. Light of Union, for Knox county, W. H. Snow of Milo, for Piscataquis county, James Morrison of Phillips, for Franklin county, Cyrus Chase of Westfield, for Aroostook county, and Charles L. Jones of Corinna, for Penobscot county, were duly elected members of the Board for the constitutional term of three years, from the third Wednesday in January, 1901. This report was accepted.

ANNUAL REPORT OF THE SECRETARY.

Mr. President and Members of the Board:

The work of the Board has continued along about the usual lines during the past year. I believe that there has been more interest manifested by the people of the State than ever before, and that the farmers are more and more working along the lines indicated by the best thought of the times. The crops have been more diversified, and as a rule the farms are becoming more self-supporting. More attention is being paid to advanced methods along all lines, and thought is rapidly taking the place of manual labor.

The crops for 1900 were, as a rule, very satisfactory. Another severe drought in the southern and western sections of the State materially reduced the hay crop. So much was this the case that in many instances farmers are at present forced to buy hay in order to maintain their usual amount of stock and keep in the market with their regular business. The value of the supplemental crop and the silo is forced home to our cattle feeders more each year, and from correspondence which reaches the office I am inclined to the opinion that more attention will be given both these articles the coming season. An abundant fruit crop brings much money to the farmers of Maine, and it is to be regretted that reliable information as to the fruit crop of the world, and the probable demand, cannot be placed before our farmers in season to be of more value to them in disposing of their fruit.

The sickness of Prof. Munson and the death of Prof. Cook seriously interfered with the Institute work in the direction of fruit growing. Yet the subject has been considered in quite a few of the meetings, and an Institute held at North Ellsworth on November 17th was practically given up to the consideration of fruit subjects. More than the usual interest has been manifested in live stock husbandry, and many of our most thoughtful farmers are taking this opportunity to purchase thoroughbred animals of the various breeds.

I append the report of our special correspondents, giving the averages of our principal crops, and as they again correspond closely with the reports of the correspondents for the United States Department of Agriculture which are from an entirely different source, believe them to be fairly correct. The general average is as follows:

Quantity of apples, 115 per cent.; quality, 107 per cent. Proportion of winter varieties, 67 per cent. Forty per cent. of the apple crop will be shipped at once. Yield of potatoes, 126 bushels. Yield of yellow corn, 45 bushels; sweet, 2,400 pounds. Eighty-six per cent. of young stock will be wintered. Condition of grass fields, 87 per cent.

In reporting the crop conditions for October from the United States Crop Reporter, I took occasion to say: "We are pleased to note the very favorable condition of the fruit market, both at home and abroad. We trust that Maine fruit growers who have winter apples to dispose of will not rush them upon the market, but will store them for later shipment. There can be no doubt but that carefully selected winter fruit will bring a good price before the season is over."

OUR LIVE STOCK.

We have 128,666 horses in the State, valued for taxation \$6,079,569. While there is a slight decrease in the number from 1899, there is an increase in value of \$21,002. From the recorded number of three, two and one-year-old colts there appears to be a steady decrease in the number of colts raised each year.

There is but a slight increase in the number of cows, but their value too has increased \$8,616.

There is still a decrease in the number of oxen, but it would appear that the large gain in one, two and three-year-olds would show that more steers as well as more heifers were being raised. There has been a slight falling off in the number of sheep and swine.

The estimated total value of poultry and eggs produced in 1898, as reported to the State assessors is \$1,418,782.18.

The total value of live stock for taxation is \$12,347,347.

OUR DAIRY INTERESTS.

The dairy interests of our State are demanding more and more of the attention of our people. The year just past has been phenomenal in the advances made along these lines. There seems to be a constantly increasing demand for good, well made, dairy butter at remunerative prices, and creamery butter making is continually being extended. The market calls for all dairy products at prices above those reached in any year for a long time, and there appears to be no danger of any overproduction of this class of goods. Maine still stands far ahead of any other State in the reputation of her sweet cream, and it finds its way into nearly every New England city.

The score of our butter at the last dairy conference was very gratifying, as it marked quite an improvement over that of former years. I believe that the time will soon arrive when the butter product of our dairies will possess as high a reputation as the cream, and to bring about that happy condition constant efforts along educational lines are necessary.

A new departure in dairy institute work in accordance with the suggestions of members at the last annual meeting has been undertaken with results that would seem to warrant its continuance. Two two-day dairy instruction meetings have been held, one in Lincoln and one in Somerset county. Separators were furnished by the various dairy supply firms, milk was purchased and brought to the meeting where the cream was separated, ripened and churned before the audiences, experts were employed to do the work and under the direction of Prof. Gowell every step was fully explained. The wisdom of carrying this practical instruction into the farm homes cannot be doubted.

THE GROUT BILL.

During the agitation over the passage of this measure which is thought to be of greater importance to our dairy interests than any legislation which has preceded it, this office has been in frequent correspondence with our delegation in Congress, and it is with pleasure that I record the fact that all of our representatives heartily supported the bill, and that I have letters from both our Senators, saying they shall use their best efforts to secure its passage in the Senate.

It may be the bill will not pass this session of Congress. But the New York Journal of Commerce says that if its friends will "keep up their organization, and keep the dairy interests inflamed against colored oleomargarine, they will be in a good position to push the measure through both houses of the next Congress."

OLEO IN MAINE.

Several indictments for the illegal sale of oleo have been obtained during the year and there are two cases now pending. We doubt if there is much sold at the present time contrary to our State law. The United States authorities are very active, and but little business is done without a United States license. There is but one such license at the present time in the six western counties, and that is a retail license. The sale has been materially lessened by the anti-color law which was passed in 1895.

In order to secure further protection amendments to our law would be necessary, requiring hotels, boarding houses and restaurants using oleo to notify their guests, and stores and carts from which it is sold to have conspicuous signs posted. These requirements are the strongest part of the Massachusetts law and most of the indictments are secured under them.

BEEF GROWING.

The production of beef on our Maine farms should be encouraged at the present time. A large part of the State is admirably adapted to this work and the increase of the number of thoroughbred beef animals would materially add to our prosperity. We now have some magnificent Herefords, Shorthorns and Red Polls. There are a few Polled Angus in Aroostook county, and this breed seems to be well adapted to the conditions that prevail there. The subject has received attention at our meetings, but not the amount that its importance demands. Efforts were made to secure a speaker of national reputation to treat beef growing at the institutes, but we were unable to do so. I hope that during the year to come much more may be done for our beef interests.

ISLAND SHEEP.

By request of Mr. Allen and Mr. Light we have investigated the island sheep industry of our coast counties. In connection with a sheep institute at Dexter, meetings were held at Machias on March 15th and at North Haven March 19th and 20th, for the purpose of bringing out as many facts as possible in relation to the sheep on these islands and for instruction to those who are engaged in the work. Mr. L. B. Harris of Lyndonville, Vt., one of the most noted importers and breeders of Shropshires in the United States, was employed, and took much interest in the work. In order to further acquaint himself with the conditions he visited Gardner's Island, situated five miles off the coast from Jonesboro, on which about 500 of these sheep are kept, remaining there two weeks previous to the Machias meeting, at which time he cooked one of the island sheep and served almost 200 people with what every one called most delicious mutton. In order to more fully give his ideas at this time I quote from an article written by him for several Maine papers. He says:

FARM HOME OF SECRETARY B. W. McKEEN.

"The great State of Maine asked me to look into the island sheep industry, and to do it in my own way. From the map, I selected the most exposed islands. I began to eat such marine growths as I saw the sheep eat. Of all the growth flung up I found the rockweed to the human taste and stomach the best, except for the salt, which, however, was about as most people like their food seasoned. It was quite the equal of the grasses of the pasture, and no more salt than are clams or oysters. In fact the aquatic growth to the sheep is as important as are the delicacies that we treat ourselves to out of the deep.

"I found a wonderful breed of sheep, fine boned, with little offal, firm of flesh, well covered with wool, head high in the air and a carriage as stately and grand as any breed. They have a knack of taking care of themselves that commands admiration. One cornered, when pressed, cleared my head at a bound and left the rattle of a fleeing deer, almost, as the only indication that a sheep had been there.

"The flavor of the cooked flesh is of the best, and not to be obtained elsewhere. This present winter I have visited the markets with a view of securing for the island sheep a distinct quotation, as no doubt it would sell high if it could be kept separate until a name could be made for it. But the obstacle that seemed in the way was the uneven and unreliable supply. The dealers would say, 'How many sheep can I get each week?' Then I said again, 'Oh, for a handful of Scotch shepherds to organize a selling movement, as well as to sow rape and turnips.'

"I chose the lull after the great storms in March of 1899, storms that have never been surpassed for severity, as my time to see their conditions. I expected to see the flocks as weak at least as the barn sheep at that time of year, but I found them much stronger than those kept in artificial conditions. In fact the sheep (a wether three years old) that supplied almost two hundred plates in the 'sheep dinner' at Machias could not have been taken from any flock of barn sheep in Maine, and this sheep was taken from the flock, with a rifle, at random.

"Again, there is no climate, nor is there any place so well adapted to the propagation of sheep in natural conditions as in the islands off your coast.

"I have visited many a sheep run among the islands and seen many a cosy shed and yard built by the owner to offer his sheep the best he had, but I have never seen an island sheep yet but that knew enough to keep away from such disease-breeding traps. As in the highlands, they want a place to get out of the winds, but a rock three feet high is enough. I have seen the choicest hay and whole oats that sheep like so much, carried out, after the most terrible storms, but I never saw a sheep that would eat them when they could get rockweed.

"If people interested in the animal industry of Maine will encourage the cultivation of rape and kindred plants, they can add wondrously to the wealth of the State, and you may see ten sheep sold, and to the epicure, where one is sold now. You may see boats loaded to the utmost with those beautiful animals going from island to steamboat or railway train, and have the satisfaction of saving to the world one of the best breeds of sheep ever evolved out of the survival of the fittest. You will have added honor and dignity to yourselves, for the care of sheep adds to the virtues of life beyond that of any calling.

"There are many practical questions for the shepherd to face. Probably the most dangerous rock in his course is the liability to bring in sires from outside the breed. You have the best sheep in the world for your purpose. Beware of crosses. Get the best of your kind, and let other kinds alone.

While a sheep is an out-of-door animal, and thrives best when not housed nor herded, he has not the ability to defend his young against the sharp-toothed wolf or fox even, so from Narragansett northeast is the only place I know in the broad world where sheep can thrive as they can here. And of what improvement that natural sheep paradise is capable, if some one whose superior knowledge would see the facts, would distribute a few bags of rape seed along that coast, with a little slip giving the simple directions for its cultivation and use! If there could be a few Scotch shepherds and plowboys brought on to the scene what a jump the sheep industry would make! Think of the natural advantages of the Maine coast as compared with the northwest of Scotland, or any of the sheep-growing parts of Great Britain."

These words are from a man who is intensely practical, who is making a great success handling a high-class article of mutton and who knows the conditions necessary for best results in the growing and handling of sheep.

THE MAINE HORSE.

For several years it has not been thought wise to talk much about horse breeding at our Institutes, neither has there been any demand for such work, still much money has been brought into the State the past year from the sale of good horses, and I believe the time has now fully come when more attention should be given this branch of stock husbandry.

The principal drawbacks, in times past, have been false notions as to the kinds of horses best adapted to our purpose, the lack of good foundation stock in the mares and the speculative nature of the business. The first condition is being overcome and instruction along lines of breeding for best results should be given in a portion of our Institutes. The grade of our mares has been raised until now I believe we have a good foundation stock from which to breed, and when we succeed in raising a class of colts and horses that has a steady demand in the markets similar to that accorded the young neat stock of the farm, which is entirely possible, we shall eliminate the speculative element.

THE POULTRY INDUSTRY.

For years the State of Maine has been an importer of poultry and eggs. So far has the demand overrun the supply that it has been difficult for several months to obtain a fresh egg upon the hotel tables of our State. Mr. Henry Van Dreser, in his spirited lectures relating to this industry has stirred our people to an enthusiasm which will, I trust, bring definite results in increasing the number of our poultry farms and in adding to the production of this valuable article of food. Efforts are now being made looking to the forming of a State Poultry Association, and the holding of poultry exhibitions in various sections of the State. This association does not propose to ask for any assistance financially but will depend upon contributions and pledges from those who are interested in the movement for its support. The forming of local poultry associations is being agitated also. In Houlton steps have already been taken in this direction. I think the Board should take some action on these proposed measures, as in my judgment the industry is of great importance to our State.

SEED AND FEED INSPECTION.

While this office has nothing to do with the execution of these laws, its only duty being to prosecute violators on notice from the director of the Maine Experiment Station, I may say that upon receiving official notice of violations of the feeding stuffs law from Prof. Woods, accompanied by him I visited the attorney general and laid all the facts in my possession before him. Acting on his advice I held personal interviews with the parties involved and was convinced that an attempted prosecution would be unwise, and that much of the difficulty arose from inadvertence on their part rather than from any disposition to evade the law. I would call the Board's attention to the last newspaper bulletin from the Experiment Station in relation to the work that has been done in the analyzing of feeds during the past year.

BULLETINS.

The publication of the bulletins has been continued through the year and the mailing list has been increased. They have been entered as second class matter in accordance with the provisions of an act of Congress in relation to periodical publications by Departments of Agriculture, approved June 6, 1900. By this means we are able to increase their size whenever necessary to treat subjects more fully than we have in the past, and at the same time the postage is materially reduced. By the means of these publications the board is enabled to reach a large number of the farmers of the State each month. The additions to the mailing list made during the year have been made without solicitation, and only on personal request from the parties themselves or their friends.

REPORTS.

The making up of the matter for the reports was changed in the last issue, so that it might come in about the order in which it occurred, bringing the annual meeting at the close of the report. By so doing we were able to issue it several months earlier than usual, as well as to materially improve its make-up. The statute sets the maximum number of these reports at 12,000 copies, but provides that the number shall be fixed by the

Governor and Council. One-half of this number is distributed from this office. One-half is sent from the library to members of the Legislature. Of our quota we now have no more than should be kept in the office to fill orders from libraries and other organizations for the completing of sets. We now have several requests for bundles of these reports for distribution, which we are unable to fill. The librarian informs me that outside of those which he feels obliged to keep for exchanges he has but few copies. I think that as there are sixty-five thousand farms in Maine, the number of these reports should be increased.

THE DEVELOPMENTS OF NORTHERN AROOSTOOK.

The Institute work in this section of the State begun in 1899 has been continued, Institutes having been held in June, at Van Buren, Frenchville, St. David and Fort Kent. Here is a large area of land lying on the St. John, which is capable of high agricultural development. The country was settled by a French-speaking people who at the present time are practising very primitive methods of agriculture. They appear to be anxious to improve, and attend these meetings in good numbers. We found evidences of advancement from our previous trip, and I learn of the building of a creamery at St. David since our visit and the introduction of some thoroughbred animals. They have a fine foundation on which to build a magnificent breed of sheep, and the growing of beef and dairy cattle can be made to form quite an important branch of their work. We saw as fine fields of wheat here as in the lower sections of the county, and look to see its cultivation materially increased in the near future. This work should be continued.

INSTITUTES.

The Institutes which have been held during the year have attracted more than the usual interest and attendance on the part of our farmers. The usual subjects have been treated, and some new ones added. Acting on the suggestion of the members from Androscoggin and Aroostook, a speaker was secured to talk on domestic science. Mrs. Sprague Taylor of Fairfield went through Aroostook county, and her addresses appeared to give great satisfaction to the ladies who attended the meetings. It would seem that this branch of the work might be pushed in the future to good advantage. The matter of winter road breaking by the use of snow rollers was treated at the Institutes in Kennebec county. Much interest was manifested in the lectures and the office has been in receipt of letters frequently in relation to the subject. We believe that by the adoption of these rollers much money can be saved, which can be placed to good service in permanent road improvements in summer. It was learned from the figures kept by two towns in different sections of the State, that one of them, breaking its roads with triangles and by shovelling, had expended $27,000 in the last ten years on its 100 miles of road, while the other town situated where snows fall deeper and remain longer had expended but $6,000 in the same time for the same number of miles of road, by use of snow rollers, and had had very acceptable roads at all times. According to these figures if only one town could be induced to use rollers each year it would amply repay for all the expense of the Board of Agriculture for more than four years.

The members of the Board have been employed for Institute work as far as possible. The officers of the Maine Experiment Station have been active and untiring in their efforts to assist at Institutes by investigations and chemical analyses. Speakers of national reputation have added to the interest and value of the work. The demand is now largely for trained speakers, for those who are familiar with the subjects they treat either from practical contact with them till they have thoroughly mastered them and worked out a success for themselves or from those who have given up the best years of their lives to scientific study and research. This demand should in my judgment be heeded as far as possible. By so doing the standard of the Institutes will be raised and their usefulness increased.

The expense of the year's work has been $3,608.42. This is covered by the appropriation and unexpended balance of appropriation for 1899.

The time reported covers the board year, from the third Wednesday in January, 1900, to the third Wednesday in January, 1901.

Ninety Institutes, one field day, seven evening meetings and a State Dairy Conference have been held.

The subjects treated are about as follows: Domestic Economy at 5 meetings; Roads at 6 meetings; Sheep Husbandry at 7 meetings; Fertilizers at 9 meetings; Beef Productions at 11 meetings; Orcharding at 12 meetings; Stock Feeding at 21 meetings; Poultry Growing at 23 meetings; Soil Improvement at 28 meetings; Dairying at 57 meetings.

CORRESPONDENCE.

The correspondence of the office is continually increasing. Letters are frequently received asking for information pertaining to the work of the farm, and are answered as promptly and fully as possible. The analytical subject-index of the reports has been continued and it forms a ready means of ascertaining at a glance the work that has been treated in the various reports ever since the first one was issued. The card catalogue of the Experiment Station publications is continued, and is of great value in looking up the subject matter treated in the various experiment stations of the country.

AGRICULTURAL SOCIETIES.

The work of agricultural societies has been of a high order as far as I have been able to learn and the fairs have been, as a rule, successful and free from objectionable features. While the multiplication of these societies beyond reasonable numbers should be discouraged and while one strong society is worth more than many weak ones, I believe they should be placed in such sections as to best accommodate the greatest number of people, to accomplish the best results.

The following figures will show the amount of business done by these societies:

Number of horses and colts exhibited	1,691
Number of neat cattle exhibited	6,997
Number of sheep exhibited	1,607
Number of swine exhibited	652
Number of poultry (coops) exhibited	1,495
Amount of premiums and gratuities paid	$20,255 95
Amount of trotting purses	22,971 35
Amount of entry fees for trotting purses	8,364 40
Actual cost of trotting purses	14,606 95

Per cent of premiums and gratuities to total awards.	47
Per cent of entry fees..........................	36
Per cent of stipend to societies not otherwise provided for by law..........................	36.96
Per cent of increase in awards..................	7
Number of societies receiving stipend............	48
Increase from 1899..............................	4

THE PRESS.

The office is under the usual obligations to the press for its kind favors. Notices of all matters pertaining to the work, and reviews of the reports and bulletins have been freely given. The interest shown by the papers of our State has been of material aid. We have nearly 75 papers on our mailing list and as far as possible matter sent out goes to all of them.

The following papers are regularly received in the office and are kept on file: The Maine Farmer, Turf, Farm and Home, Bangor Weekly Commercial, Lewiston Journal, The New Age, Kennebec Journal, Country Gentleman, New England Farmer, Mirror and Farmer, Hoard's Dairyman, New York Produce Review and American Creamery, The Farmer's Voice, Farm and Home, New England Homestead, The Hay Trade Journal, and several local papers.

CONCLUSION.

In conclusion I wish to thank the executive committee for its unselfish and valuable work during the year, the members of the board for the interest they have shown, and the uniform courtesy which I have received at their hands. It is very pleasant to be able to say that during the entire year no unpleasant word has been spoken between us and that perfect harmony has prevailed in the arranging and carrying out of the details of all the work. It is also pleasant to be able to say, as I believe with equal truth and candor, that never in the history of the Board of Agriculture has it stood higher in the estimation of the farmers of the State than it does at present, never was its work more fully appreciated or its chance for future good service so great as at present.

PASTURE SCENE ON FARM OF SECRETARY B. W. McKEEN.

REPORT OF THE EXECUTIVE COMMITTEE

A meeting of the executive committee was held at the State House, August 20, 1900. The business under consideration as a committee was in relation to holding an all day meeting at the State Fair. Voted, that we consider it not advisable.

Your committee also met January 15, 1901, as directed by the board, to examine the books and accounts of the secretary. We have examined the books and accounts, compared them with the vouchers and have found that they are correct.

J. M. WINSLOW,
E. F. ALLEN,
F. H. ROLLINS,
Executive Committee.

On motion of Mr. Ellis,

Voted, That this report be accepted.

Adjourned until 2 o'clock P. M.

WEDNESDAY, JANUARY 16—AFTERNOON.

Election of officers being now in order, the following officers were elected, by ballot: President, E. F. Allen, Columbia Falls; vice president, Nahum Hinckley, Bluehill; secretary, B. Walker McKeen, Augusta; member of the executive committee, J. F. Buker, Bowdoin; member of advisory council of the Experiment Station, B. Walker McKeen.

The following committee on pay-roll was appointed by the chair: A. N. Douglass of Kennebec county, J. F. Buker of Sagadahoc county, and W. H. Snow of Piscataquis county.

Mr. HINCKLEY—I am very much pleased with the work done in our county in the institutes. I can see a marked improvement by the farmer; but I think the board should have an annual financial report. I have had some experience as a selectman, and also for six years as county commissioner, and we expended on the addition to our court house something near 20,000 dollars, without a vote of the citizens of the county and without taxing the citizens one dollar. There was a great deal of comment about it, but it was needed and we did it, and at the end of the year we flung out an itemized financial report that showed the expenditure of every dollar of that money, and no man has protested against it. I would like to know why there could not be a printed fiinancial report ready at the annual meeting. Then each member can take his report and examine it and not have to refer to the books. It is a very easy matter to make one up. I am thoroughly in favor of the secretary of this board. He has done us lots of good in our county. I simply say these few words for the benefit of the Board of Agriculture.

On motion of Mr. Hinckley,

Voted, That the secretary of the Board of Agriculture have printed an itemized account of the financial standing of the board, and that such report shall be issued on or before the second Wednesday of each January, and be incorporated in the annual report.

On motion of Prof. Woods,

Voted, That it be a part of the duty of the executive committee to audit the accounts of the board and report at the annual meeting.

J. F. BUKER—I want to say a few words in regard to the testing of milk at fairs. This is something that I have been directly interested in. I have been an exhibitor at the fairs for some ten years, and quite a part of the time Mr. McKeen and Prof. Gowell have tested the milk, and I know, being an exhibitor and being in those tests, that the exhibitors have had more courage on this account. They believed that they would get nearer what belonged to them than if the society had stepped out and picked up a man they could have got for less money. As to whether the board should pay for this or the society is a matter for us to consider. I am aware that it puts a great deal of work upon our secretary and Prof. Gowell. The secretary has to be there at six o'clock in the morning and weigh the milk and take the samples, and again at six o'clock at night, and then he has the testing and the figuring. As I understand it, he gets nothing directly from it, neither does Prof. Gowell.

Prof. WOODS—There may be some misapprehension in relation to whether the board has a right to do this work. The law states that the secretary shall so far as practicable aid and encourage agricultural societies in their efforts.

Mr. HINCKLEY—I think that this matter is just as legitimate as to take samples of milk at institutes and test them there. A much larger circulation of knowledge goes out from the fairs than would from an institute.

Dr. HARRIS—It has occurred to me in connection with this discussion that it might be practicable to make a valuable use of the fairs in institute work, if you had the right kind of a man who could take men through the fairs and show them what is of value. You might get a practicable demonstration in certain lines.

On motion of Mr. Buker,

Voted, That the secretary continue this work of testing milk at the fairs as he has done in the past.

WEDNESDAY, JANUARY 16—EVENING.

THE DEBT OF AGRICULTURE TO EDUCATION.

By Dr. A. W. HARRIS, Orono.

I assume that we agree that agriculture does owe a debt to education; indeed it seems almost a truism to make such an assertion, for if there be anything that American people, and especially the people of New England, seem to believe in, without hesitation or doubt, it is the value and necessity of education. In my opinion, Emerson has said nothing more stirring than that short paragraph which we are accustomed to print at the beginning of every catalogue of the University of Maine. You will remember how it starts out "I praise New England because there is the most liberal expenditure for education," and had he lived until this time he must have extended his commendation to include not only the rocky states of the northeast, but the empire of the northwest.

It is inspiring to notice how ready is the support which educational measures receive. The legislature, now in session, will consider many matters and make many appropriations; it will care for the interests of roads and bridges, prisons and hospitals, and make liberal provision for the protection of society and for the care of the unfortunate—objects which certainly ought to have the careful and sympathetic consideration of the state; but when all discussions are closed, it will inevitably be found that the larger share of the state money will have gone to the cause of education.

Nor is this faith in education confined, by any means, to the state. It is as real and as active among philanthropists as among statesmen. As a rule we seldom find the State making provision for that which private individuals will do; nor do we find much enthusiasm among private individuals for causes which the state has undertaken; but in the field of education there is a spirited rivalry to see who may do most to liberalize, broaden and cheapen education.

The most important motive which lies behind all provision for education is the desire to benefit the individual. With it goes the belief that this may be done best by providing him educational facilities and opportunities. This ought to be the chief motive. Property owes brains an education; not only because of the benefit which property is to receive as a result of that education, but because the possession of one's own powers is the right of the individual, which the State must secure and protect; a right just as important and sacred as the right of liberty; indeed, there is no liberty which is better worth having, than the freedom from the chains of ignorance, and from the disadvantage of fighting the battle of life with anything less than the best weapons which one can use; but the importance of education to the individual is so well recognized that it is scarce worth my while to speak of it in this presence, unless it be for the inspiration and satisfaction that comes from the consideration of a great cause in which we profoundly believe. When we were in the midst of the last war, I was sometimes inclined to think even that direful experience worth while because it taught again to many of us, who had grown stolid and hard hearted, or thought we had, the ennobling sensations of patriotism. It is a great thing indeed for men to turn from the grind of life, and know what it is to have a catch in the throat and a tear in the eye, as Old Glory rises in the air. It may be worth while to-night to have spent a moment on subjects that are dry, if only that leads us to appreciate the greatness of certain familiar enterprises, that maintain in every town and every corner of this State the free school, as the open door by which the next generation may climb into places of usefulness and power, not only in this State, but wherever men are needed. This is indeed a tempting theme, but the one I have selected for to-night is a more humble one, and I must resist the temptation to leave it too long in the background. I invite your especial attention to the debt which the industry of agriculture owes to education, and the first point which I wish to make is that this question is not the same as another one, which is often confused with it—I mean the debt which the farmer owes to education. The advantages which agriculture, as an industry, has reaped from education are not, of necessity, the same as the advantages which the farmer, as a class, reaps from education. Here lies an important distinction. That is an advantage to the farmer which makes his life more easy or more pleasant, but this may be of little, if any, advantage to agriculture as an industry. That is an advantage to agriculture which renders it more productive. The advantages to the farmer belong largely to him. Advantages to agriculture are likely to belong to him only as they are divided to all members of the community. Imagine, for a moment, some change of method, or improvement in machinery which doubles the product of potatoes from a given amount of land or a given amount of labor. The result will be an advantage to agriculture, as an industry, but the farmers who have been accustomed to depend upon the raising of potatoes for their livelihood will find themselves embarrassed by an overstocked market, which means a fall of prices. The world has been benefited; a class has been embarrassed. There can be little doubt that education, using the term in its broadest sense, has actually embarrassed the farmer, as a class, in this very way. We hear much about the movement from the farm to the city, and we have searched widely for causes. Now, in the end, one cause must come very near to being the complete explanation of this movement. There is a better chance for employment in those industries which gather in the cities than in the country. A distinguished head of one of our agricultural colleges has recently made this statement that, within a hundred years, the productiveness of the individual farmer has been multiplied by four; in other words, that then it took four men to provide food and raw material which are now produced by one. In order then to make room for all the farmers' boys upon the farm, it has been necessary that the demand for farm products should have increased four times as rapidly as the population. We know, however, that this cannot be true, because the farm is the great source from which the cities draw their population. The result has been that there has been upon the farm a surplus of men as well as products, and it has been inevitable that these men must find their opportunity for work in other callings. Had all of them, or even a large portion of them, insisted upon staying upon the farm, we should already have had in this country a large class of peasants struggling for a living, and forced to learn how to live on the least possible income. While we cannot see the abandonment of old homes without sadness, we must recognize the fact that this result is in accord with the trend of events, and has already, in this country, resulted not only in maintaining our agricultural position among the nations, but at the same time has gone a long way towards giving us the commercial and manufacturing leadership of the world. It is idle to treat this tendency as if it were the fault of some class, and to attempt to lay blame on the shoulders of any man. It means nothing more than this—that the American farmer has put so much brain into his work hat he has reduced by seventy-five per cent the brawn needed, and has found time to do not only what his forefathers did on the farm, but to take upon his broad shoulders, as well, the burden of the country's manufactures and finances The son of the American farmer is the great figure in our history, too big to be kept on any farm or in any town, to be confined to any state or any trade. He has filled the world's markets with food products at a lower and lower cost. He holds the reins of the world's finances. He pleads in all our courts, and prays in all our churches. He leads on the field of battle, and commands in the great struggles of industry. Let us not lament, then, that he has gone forth into the world, but rather rejoice in the laurels of his conquests. If you would keep the Maine boy on the Maine farm, try to shut your schools and you may succeed in crowding a fair proportion of your sons into a life and death struggle for an existence in one industry; but, thank God, even such a course can not succeed. Such an attempt would bring about a rebellion, from the young blood of the State which would sweep all before it.

I take this illustration to make clear the fact that the benefit to the industry may be an embarrassment to the individual, but, lest you may suppose this illustration is to be regarded as representing the whole of the effect of education upon the farming community, as a class, I wish to state most emphatically that, in my opinion, education has been of the most enormous benefit to the farmers, as a class. Living, as they must, in isolation, their contact with the world must be through various channels of education, and to close for them the school, the agricultural college, and the agricultural press, would be to deprive them of that knowledge of the world.

I have made this distinction between a benefit to the farmer, as a class, and a benefit to agriculture because it does away with a criticism which is very frequently urged against state aid to agriculture. I grant that farmers, as a class, ought not to receive any benefits which are denied to other classes, but I am equally clear in my conviction that agriculture, as an industry, should receive state aid, far beyond that which is ordinarily given to other industries, and with a brief statement of my reasons for this opinion I will bring the first half of my address to a close.

For the encouragement of those arts, which find their expression in the design and manufacture of machinery, the general government has provided liberal encouragement through the patent laws; for the encouragement of the fine arts and literature, encouragement has been provided through the copyright system; for the upbuilding of manufactures and trade, we have made ample provision through our tariff laws. In addition to this provision, many branches of manufactures and commerce are able to do much in the way of helping themselves, and this ability increases with the present tendency towards concentration. A great corporation can afford great expenditures for the improvement of methods. An iron or steel company that deals in millions can easily afford to employ a chemist, or several chemists to test its materials. If you sell iron, cement or any other commodity to Andrew Carnegie, he will pay for it on a basis determined by chemical and physical analysis. The chemist is an expert and must receive high pay, but his field of labor is so extensive that very small savings enable him to earn his salary many times over. The small dealer, and such, by way of comparison, all farmers must be called, cannot, on the other hand, afford to employ an expert to analyze his fertilizers, or to test his feeding stuffs, or to make sure that his cattle are free from disease, and to prosecute the dealer who infringes on the name and reputation of his dairy products. His business is so small that such a course would eat up the whole of his profits; nor can he afford to employ experts to study different improvements, for when they are found he can apply them only on a very small scale, and even this small benefit must be shared with his competitors. The very conditions, therefore, of agriculture, the fact that the farm is a small enterprise—and I trust it always may be such—forbid the application of science and study unless by some system of co-operation. If that system may not be found, agriculture must suffer, and its suffering is at the expense of every consumer. It is then necessary that investigations and studies in agriculture should be carried on by co-operative endeavor, and because the whole public is interested in the result, that the whole public should pay the cost.

If I am right in these opinions, my further task will be to show how education has benefited the public through improvements in agricultural pursuits, and I use the term education in its widest sense, to include not only the elementary studies of the common schools, and the work of the agricultural college and experiment station, but, as well, the work of the agricultural press, farmers' institutes, and farmers' clubs. I cannot take the time to point out the part that each of these agencies plays, but this is not necessary; they work toward the same end; they ought to work in harmony. Of course I cannot expect to touch upon many specific results of educational effort, for they are entirely too numerous, nor can I hope to adopt any system of grouping which will be inclusive. I make no claim for completeness in the outline of my statement.

The first great benefit of education, which I wish to mention, is the establishment of the scientific method as a rule of farm practice. Let me explain what I mean by the scientific method. We sometimes hear of working by "rule of thumb." The scientific method is the opposite method. He who works by rule of thumb, takes certain ready made rules and applies them to all conditions. The scientific method is nothing more or less than the thoughtful one, which attempts to examine and study conditions and effects in such a way as to bring out the causes of results. When the margin of profit was large and enemies were few, the rule of thumb method was fairly satisfactory, but it failed just so soon as competition sharpened and difficulties increased. Then great differences began to appear among farmers, and we began to have the farmer and farm laborer, the man who earned his living by his brain and the man who earned his living by his muscle. Imagine what would be our condition if you could subtract from the agricultural population those who do the thinking. Now education and investigation have, in the last thirty or forty years, laid down the lines of that thinking. The farmer no longer lays his difficulties to an evil spirit, or a phase of the moon, but finds a way in every situation by cool, logical methods. He is applying exactly the same methods that other business men of success apply, and he is sharing the benefit which education, and more especially science, have bestowed upon all business enterprises. This keeps him watchful for all local conditions, for changes in the soil, the atmosphere, the weather; it makes him a student of the market and of business methods. It used to be thought that a farmer could be made of any material; the bright boy was put into the law or the ministry, but the dullest lad in all the family, with the scythe in his hand, was the farmer. No such methods will ensure success to-day. The farmer who sends goods to market, whether dairy products, potatoes or small fruit, must send them in good condition, so that his label shall come to be regarded as a guarantee of his goods. In the first place, then, education has greatly benefited agriculture, by teaching the farmers that their work is to be not only labor but thinking as well.

Education has, too, enormously helped agriculture by raising up the leaders. Some time ago I was interested in a list of graduates of the University of Maine, who had gone into one single line of agricultural activity, the experiment station work. The number which this comparatively small institution has contributed to experiment station work has averaged nearly one for every year of its existence. Among these are included several men of great distinction. There is Balentine, whose studies on the feeding capacity of the plant lie at the basis of what is some day to be a very important part of the whole problem of plant food. There is Farrington, who is conducting the most successful dairy school in the United States, one which has been not only a benefit to the state of Wisconsin, in which it is located, but an inspiration to the dairying industry throughout the whole country. There is Scribner, who is attempting with good promise for success, to develop a grass that will grow in the Southern states. There is Jordan, who stands at the head of the wealthiest of all the experiment stations of our country. Who can calculate the benefit conferred through the activity of such men. Note how this leadership extends itself, suggesting the organization of a great army, with its commanders and generals, and colonels and captains. The greatest leader, use whatever methods he may, can succeed in impressing only a small proportion of the population which he serves. Many farmers never heard of him, but a few appreciate the principles on which he works, and the value of the results which he reaches, and they become his lieutenants, transmitting his orders to others of their own acquaintance, until at last the true science has been sifted out from his work, and comes gradually into application upon the farm. The spread of an idea of real value throughout a state is something like the spread of a new weed, such as the hawkweed. In the beginning we find it perhaps in one place alone, transferred by one means or another, into two or three more, which become centers of dissemination until the distribution is complete. Without formal education there would still be leaders, but if each of these were left to work up from the beginning for himself very few would obtain important results. It is only by the establishment of schools, which collect and systematize knowledge, and enable each man to stand upon the shoulders of his predecessor that we mount into great leadership, and a very few really great leaders justify all the expenditure that we make for agricultural education, and more too. I was struck not long since when I noticed that of four men considered for an important official position, connected with agriculture in one of our New England States, all of them were college graduates. This particular form of education had given those men a distinct advantage as leaders.

But we must not suppose that the advantages which education has conferred upon agriculture come entirely from what is known as agricultural education, such is far from being the case.

All industries are mutually interdependent, and agriculture has reaped great advantages from the work of education as applied in other lines. Her success has been dependent upon finance, commerce and transportation. For the purposes of illustration, invention and the production of machinery are the most striking. There was a time when the farmer was, of necessity, a jack of all trades. The plow which he used was of his own manufacture, and he must know how to do a multitude of things, a multitude so large that it was very unlikely that he could do any of them well. All the results of the mechanic arts are now at the command of the farmer, and agriculture has become enormously more productive as new forms of labor saving machinery have been applied.

In this way a whole body of specialists has been developed, each devoting attention to one branch of industry. This has not only resulted in better machinery, but has enabled the farmer himself to become a specialist. When he was obliged to provide his own clothes, his own machinery, build his own buildings, raise his own seed, and to do all these things in addition to what we now regard as the proper work of the farmer, he had little time for study and investigation, and that little was necessarily spread over a field of the very greatest extent. To-day the farmer is confining himself to a much smaller field. The successful man is he who makes his success by the application of the best methods and the most complete knowledge to a restricted part of the general field of agriculture. That may be small fruits; it may be grain; it may be cotton; it may be dairy products. It is sure to be, in the hands of a man of ability and conscience, a field much better tilled than was formerly possible to men of the greatest ability.

Perhaps no result of technical agricultural education is more useful than the furnishing of a basis for agricultural publications, and the topics for the agricultural press. I do not belittle in any way the importance of farmers' institutes, or experiment station bulletins, or government documents; but these are all inferior to the agricultural press as a means for disseminating sound knowledge. But for the best results, the agricultural press must ever remember that it is in a sense a newspaper, and, like other newspapers, must report the news and not manufacture it. The gravest danger which faces the agricultural editor is very like the danger that faces the teacher. Each one speaks with a tone of authority, and, unless he is extremely careful, comes to have an unconscious belief in his own inspiration, and yields to a temptation to assert his opinions as if they were facts proved and demonstrated. This is, of course, the worst kind of dogmatism, and is, in reality, a great perversion of a public trust. Someone has spoken of a certain New York newspaper as "the weekly last judgment." Let the agricultural public be thankful, and no part more so than the agricultural editors, themselves, that education and investigation have saved the agricultural press from a similar characterization, and have delivered us from the multitude of strange gods, into which otherwise the vagaries of human self esteem might have developed the agricultural press.

I have left myself only a few moments in which to refer to the benefit conferred by the educational institutions especially designed to help agriculture, the agricultural college and the agricultural experiment station, and these are to be regarded in their results as essentially one. As is well known in this assembly, their organization and support make them quite distinct from each other. The duties of the agricultural experiment station may be divided into two groups—those prescribed by the United States Government, and paid for by an appropriation from the United States Government, to be expended under the direction of the trustees of the college; the second group are those duties prescribed by the State, and paid for by the State, either by fees or by appropriations. While all this work is under the direction of the trustees of the college, of course it is not strictly college work, and, if it were removed, the college would still have for the purpose of instruction its own funds unimpaired and undiminished. Most criticisms of the experiment station work, certainly those in this state, are directed against the duties imposed by the state, and performed under conditions and rules which are prescribed either by the law or by circumstances, and subject to very little modification by the trustees. These police functions, however, are to be distinguished from the strictly educational and investigation work of the college and station. The police functions are imposed upon the experiment station because it is the one scientific institution possessed of a trained body of analysts and investigators, over which the State has control. The essential work, and that to which I wish to call attention now, is its investigations; and these investigations in the agricultural sciences, lie parallel to instruction in the agricultural sciences, and these are essentially one work. The agricultural experiment station, as an administrator of the various controls, is simply an instrument of the State government. The agricultural experiment station, as an investigator, is a part of the agricultural college.

Note very briefly a few of many results, as an illustration of the really marvellous work which has been done in about a generation by this institution—work, which, in my opinion, is not exceeded in any line of investigation by any single agency. I shall confine myself to four things as topics, or illustrations, of hundreds which might be quoted. Those which I select are among the more important ones, but by no means the most important.

Several years ago a Turkish missionary sent to this country the naval orange. In time this was introduced through scientific channels into California and Florida. Its value was promptly demonstrated, so that California growers replaced their matured orchards by the naval, and it has been soberly stated, and without contradiction, that the introduction of this one variety has been worth more to the state of California than its total gold product. This illustrates a whole series of investigations, which have for their purpose the development by selection and cultivation or transfer of improved varieties of grains, vegetables and fruits, and the adaptation of particular plants to particular conditions. It might have been illustrated as well by the development of the small fruits, or the introduction of the Russian apple.

Another field of work has been the protection of the industry from damage by insects. Some years ago there appeared upon the orange tree a new insect, known as the scale insect, which spread at first slowly, and then rapidly throughout the orange ranches, and promised to destroy the whole industry. An appeal was made to the entomologist. The insect was new and little was known of it, but the men of science immediately applied to the problem the methods which they had been accustomed to apply to other fields. They asked the reason for this plague, and traced it back to the introduction of certain orange stock from Australia. The next question was, why should this insect, which comes from Australia be a plague in California although it is not in Australia? Several answers were possible. Among them it was suggested that there might be in Australia an insect which preyed upon the scale insect and kept it under control, and that this parasite had not been introduced with the scale insect. Investigation proved that this answer was correct, and the solution of the problem was thereby easily brought about by the introduction of the parasite.

Another class of work involves the minute study of the causes of familiar phenomena. At the present time this is nowhere so active as in the realm of bacteria, and is best illustrated by the study of dairying. A few years ago we knew that a certain course was likely to produce given results in dairying, but we did not know why. The bacteriologist has now made it clear to us that the making of good butter is largely dependent upon so controlling the growth of bacteria that we shall discourage those that produce a bad flavor and texture and encourage those which produce the good. Furthermore, the bacteriologist has taught us how these things were to be accomplished, and, as a result, we are well on the way toward making dairying an exact art. When this is done, then we shall find it as easy to make good products as it formerly was to make bad ones, and education will have added to the wealth of the world in a measure that is beyond our computations.

Another field of investigation has been the invention and perfection of apparatus, and this has no better illustration than the Babcock Milk Test. Formerly there were two ways of finding out the butter fat in milk—one the churn test, the other, the chemical test. Both were difficult and unsatisfactory. The result was that the farmer had no accurate means of knowing how much butter each cow in his herd produced. The Babcock Milk Test gives him an extremely simple, quick, and cheap method of determining that fact, and has revealed some surprising results. We now know that in any large herd of untested cows there are some which fail to pay their board. The Babcock Milk Test, in the hands of an intelligent farmer, sends such cows to the slaughter house. Calculate, if you can, what the effect of this instrument must be on the breed of cattle. Generation by generation we may expect our breeds to improve, and it is certainly well within the facts to state that the making of this single piece of apparatus is worth to the world more than the capitalized cost of agricultural colleges throughout their history.

Another department of work is the study of diseases that attack animals and plants, and the problems are not very different. Sooner or later we shall solve most of them, including the most dreaded tuberculosis. For illustration, take the diseases which periodically attack the potato crop. It has been demonstrated that spraying with Bordeaux mixture is a satisfactory remedy. Last summer the Maine station made experiments in Aroostook county, with surprising results. I need only state them to make my point clear. Had the whole county last summer sprayed its potato crop as the Experiment Station potatoes were sprayed, the product of that county would have brought in the market, at ruling prices, from $750,000 to $1,000,000 more than Aroostook farmers received for their product.

But without taking time for further illustrations, I trust I have made it clear that our faith in the results of education and investigation, as applied to agriculture, is not misplaced, and that the preservation of our agricultural standing depends to a very important degree upon the strengthening and preservation of that faith as a guiding principle in State action.

In conclusion, lest it might be thought that I have placed my discussion of the subject upon too low a plane, and have appreciated only commercial and monetary results, let me say briefly, but in form as emphatic as I can, that the benefit overtopping all others, which has accrued from education to agriculture, is the uplifting and upbuilding of the farmer himself. No products of science or engineering will be of permanent or great value to any industry unless their use is in the hands of a man of ability and self respect. The farmer is to a great extent a man of isolation. His work is largely by himself, and isolation has two opposite results—either it develops overweening self conceit, as in the closed nations of the east, or it develops timidity and lack of self confidence. Education, enabling a man to measure himself by other men and to esteem properly the importance and position of his own work, makes a man among men, and the best product of agricultural education is the intelligent, self respecting farmer.

THURSDAY, JANUARY 17—MORNING.

Meeting called to order by the president at 9 o'clock.

Mr. ROBERTS—Some of my people have asked me to present a matter to the Board, and as I may not be able to be present later in the session I would like to say a few words in relation to it at this time. Those of us who live in fruit sections all know that this year farmers in their haste have sold their fruit at a great loss. They were led to this course by the conditions which existed four years ago, when many farmers were offered $1.00 for their fruit and refused, believing it would be higher, and lost nearly all they had. This year, being warned by that, they have been caught the other way. Some people have talked the matter over, and they believe that information could be obtained from the apple regions of this country and spread before the people of our State sometime in the month of September, and in that way they would be better informed. It has seemed to me that it was a matter that this Board could at least discuss, and if there are no obstacles in the way that cannot be surmounted I believe that the Board could do no better work than to take hold of this. I do not know just what plan could be worked out. I do not know whether the secretary could obtain the information through the executive officers of the Boards in other states, or whether it would be necessary to have a corps of correspondents. But in some way or other it does seem to me and to others who have talked with me that this Board could accomplish something in that direction that would be valuable and save our State many thousands of dollars. Last year in our section the buyers started at $2.00 a barrel and bought quite a lot of fruit. Many farmers did not hurry about selling, did not go out to hunt up a buyer as they do sometimes, because they believed that the crop of apples was so small that buyers would be around. I was caught in that way myself. The buyer came when I was away, and said he would be back, but he was detained and did not come back and in a week or ten days I saw him and the circumstances had entirely changed. The buyers had started in on the same theory that the farmers had, that there was a shortage, and had fixed the price so high that they met with a loss and had to stop buying. If we had known the actual conditions many of us would have been in a different situation at the close of the season. I hope the Board will talk this matter over, and if any action is possible I hope it will be taken.

Mr. ALLEN—I would like to ask Secretary McKeen if he does not make some report of this nature.

Mr. MCKEEN—It is a difficult matter to get accurate returns in relation to the crops. The only means of information that I have is from the Department of Agriculture at Washington, and their crop report is issued about the middle of the month, for the month preceding. You see it is fifteen days before it gets to the State departments of agriculture. I realize the importance of this matter that Mr. Roberts has brought up. I am aware that the people of our State suffered severely on account of not knowing the condition of the markets early, as far as fruit was concerned. There were several very peculiar circumstances that combined to change the price of apples. In the first place, an excellent freight arrangement was made by the general manager of the Maine Central Railroad, which enabled the apple buyers in Maine to ship apples from any point in Maine as cheaply as from any other point in New England. I think the rate was about 22 cents a barrel to Chicago and Milwaukee. That brought the apple buyers to our State en masse. For several days this office was in receipt of letters and telegrams from parties in the Western and Middle states asking me to wire immediately the best places in Maine where they could send agents to buy fruit. Then, of course, climatic conditions came in that influenced the market, and there are some conditions that no forecast would cover. I should be very glad indeed to have the Board fully consider this matter, and later we could consult the department at Washington, if we wished to do so, and see if there is not some practical way of getting information before the people which shall be of value. We held an institute last fall at North Troy in Waldo county, and a Mr. Bartlett there had an exceptionally fine lot of fruit. He was entirely at the mercy of the local buyers, and felt as though he had to dispose of his apples at prices that would hardly pay for picking. We encouraged him to hold his fruit and ship it himself. I wrote a letter to Mr. Atherton at once, asking him to give Mr. Bartlett the benefit of his experience in selling fruit, and the names of reliable persons to whom carloads of apples could be shipped, and Mr. Bartlett gained several hundred dollars by waiting and consulting with the apple buyers outside of the State.

Mr. WINSLOW—I am in favor of what Mr. Roberts has suggested. I think that so far as possible the Board should use its influence to place before the people of the State information in regard to the fruit crop, and at about the selling time.

Mr. ROBERTS—Information from the United States department is so late that it would hardly get around in time to be of value. I question whether it would not be feasible to have communication direct with every state. Every state has a Board of Agriculture or commissioner, some official of this kind, and if communication could be entered into with them whereby information could reach this office by the middle of September and be given out immediately, it would be of much value.

Mr. TRUE—We hear some complaint in our section that the buyers have banded together to mislead the farmers, but I do not think that is true. I think the buyers in our section were just as much mistaken as the farmers. If they had not been, they would have bought every apple, at a larger price. One of the buyers and shippers in my town claims that green men would have done better than they, because they had been beaten in years past and were very anxious. They commenced at 90 cents and bought only a few, not daring to take any more, so they were as ignorant as the farmers. It does seem to me, as Mr. Roberts suggests, that we could get some communication from each state that would give us the fruit situation and give it to us in detail, as to the different varieties. Some states may have a full crop and nine-tenths of it may be fall fruit. That is out of the way before our shipping fruit comes on. If we could get information to this extent it seems to me that it would help us remarkably.

Mr. GARVIN—I have understood that the Western apple buyers combined and sent broadcast over the State the report that the crop was immense, and took advantage of our getting beaten four years ago. In my section men came from the West and bought every apple they could get for $1.00, and put them into Chicago. I rather think they know their business better than we do. Their report led us to not take as good care of our apples as we might. If they were unhandy some of us let them go, and some sold for what they could get on the tree and let a good many go to waste. If we had known how the crop stood we could not only have saved in price but in quantity.

On motion of Mr. Roberts,

Voted, That the secretary take under consideration the practicability of obtaining information on the apple crop in the various states of this country and foreign countries and give the same to the farmers of this State in the month of September or October, if he finds the same of of not too great expense.

FIVE-MINUTES' TALKS BY MEMBERS.

LINCOLN COUNTY.

J. M. WINSLOW—I have nothing new to suggest. In my county the institute work has been along lines that we must continue in the future. We have mixed farming, and lectures on almost any line of farming are beneficial. What we need as much as anything is something to enthuse us. If we can get the farmers to attend the meetings, and have two or three lectures on different subjects during the day,—something to enthuse them,—it answers the purpose. If I am going into a locality to hold an institute and find that there is any special subject that the farmers would like to have discussed, I mention it to the Secretary, and he has always been willing to provide a speaker to take that subject.

YORK COUNTY.

S. H. GARVIN—I have had but little experience in this work. When I have been out to plan institutes I have asked the farmers what they wanted to have discussed, and some would suggest one thing and some another. Some would like to know the best way of renovating poor land, and some the most economical feed for stock, etc. Our farming is diversified. We do considerable stock raising. I think there is as much beef raising as in almost any county in the State, and quite a lot of young cattle are raised there. Anything in relation to the economical feeding of stock would interest the majority of farmers. We produce some milk, and there are several creameries in the county that do quite a business, besides the private dairying. Whenever I have been into a section I have found out as near as I could what they wanted, and have given it to them if I could.

WALDO COUNTY.

JOSEPH ELLIS—Since I became a member of the Board, and for years before, I have been very much interested in the institute work of the Board. The farmers' institute always called me, if it was a long distance to go. And I am free to say that since I have become a member of the Board and it has become my business to look the matter up, I have been well pleased and gratified at the attendance at the meetings. The farmers have not only profited by what has been said but they have taken interest enough to speak to me about it and ask me to have more meetings, and I have calls all the time. I think this has been brought about somewhat, perhaps, by my taking pains to mingle with the people. It has been my theory since I became a member of the Board that we should take advantage of the grange meetings. Somewhere near the time when we were to hold an institute I would go to the nearest grange, perhaps, and speak in the line of the subjects that we were working on, and I flatter myself that it has had a good influence, that we have had more interesting meetings and the people have been more interested. Perhaps that is not the best way, but it seemed to be the way that I could get at the people most. I think the interest in the institutes is growing in our county very much, because in the new localities where we have not been in the habit of holding institutes, they are calling for them. In relation to subjects, in a portion of our county the people are very much interested in creameries, and the dairy business. They have been in the habit of selling hay, but now they are becoming interested in the dairy business, and whenever a subject has been suggested to me it has almost invariably been dairying. Fruit growing has received some attention, but next to dairying the subject that has been of most interest is poultry. I think about as enthusiastic a meeting as we have held in our county has been when we have had a speaker on poultry. I think the people of our county are well satisfied with the work of the Board for the last few years.

KNOX COUNTY.

E. E. LIGHT—I feel somewhat as Brother Winslow does about this matter. I have tried to suggest new things for many years and have got about to the end. I do not know what new line we can take up except the culture of Belgian hares. I have tried, in arranging the institutes in Knox county, what seems to me the most practical way to please the farmers and do the most good. My method has been to work through the granges as much as I could. I always make it a point to advertise the institutes in the Pomona Grange. Recently it has seemed to have better results to have a larger number of meetings distributed at more points; that is, to have a large number of smaller institutes rather than to have a fair number of larger institutes. This seems to me to be the most acceptable. I have always consulted the leading farmers, those that take an interest in the matter, as to what subjects would be most desirable to discuss. The difficulty with that is that there are many men of many minds, and to please all you would be obliged to have a great many speakers and subjects. We have to settle on the one most generally wanted. The subject of dairying seems to be an interesting subject in almost every section, and also orcharding. Occasionally it might be well to discuss some other subjects in some localities.

I would like to express in a general way an idea that I have been considering, and that I have mentioned to Mr. McKeen, that might apply to my own county as well as to other counties. I am impressed with the opinion that we are doing too much for these state dairy conferences, that they are too expensive for the number of people that attend them. The effort has been to improve the quality of our goods, to increase the interest in dairying, and in every way promote the industry. But the members of the Board who have attended these conferences have known that the rank and file of the farmers of the State of Maine do not attend in large numbers, and when we have a meeting that costs somewhere in the neighborhood of $700, and is not attended by a larger number than we usually have, I am impressed with the idea that it is rather too expensive a meeting, and I think that efforts should be made to reduce the cost. While I would not abolish the dairy conference, unless something else was substituted for it, I would try to lessen the expense considerably. Now there is pending before the Legislature a bill for a dairy bureau and a dairy commissioner, and the indications seem to be, as far as I can get the drift of opinion, that its passage is quite uncertain. I would suggest that we reduce the expense of the dairy conference considerably,—perhaps two or three hundred dollars and more if possible,—and that we take the amount of the reduction and devise some means by which it shall be expended by the Board, through the secretary and such members of the Board or such parties as it is advisable to employ, in work along the lines suggested in the proposed measure and improve the quality of our dairy goods. I have not considered this proposition long, and have no definite ideas in relation to it. I am simply offering suggestions. I wish we might be able to get a better feeling among the patrons of the creameries and the creamery managers and proprietors; that a dairy institute might be held at the creameries, or in connection with them, so that in some way the parties might be drawn together for mutual benefit. Any way that this Board could devise to expend a part of the funds we are now expending for the dairy conference, along dairy lines in a manner which would be for the benefit of all parties concerned, would be in accordance with my ideas.

ANDROSCOGGIN COUNTY.

J. L. LOWELL—In Androscoggin county this fall we have held four of the most successful institutes that I have ever known anything about. Dairying has been the leading feature, and I think we were very fortunate in having Mr. Van Dreser with us. I think he created an interest that has never before existed in that section. He seemed to have a faculty of getting at the farmers, interesting them, and impressing upon them their duties and what is required to make first-class butter. And I believe that more of this kind of work should be done, in our section at least. Another line that I am very much interested in is poultry growing. This has taken a new start and is receiving a great deal of attention from our farmers. In relation to the dairy meeting, it seems to me that we had a very successful dairy convention at Lewiston a year ago last fall, and I think location may have something to do with the attendance and the display that we have. If we should hold another one at Lewiston I have no doubt but that we should be more successful than we were before. Another matter, to which I have alluded before, is the raising of horses, but as that does not interest this Board very much I shall not press it.

PISCATAQUIS COUNTY.

W. H. Snow—I do not know that I can suggest anything new. We had some very interesting meetings in the county last fall. We had Mr. Van Dreser with us at one, and had a large attendance and the meeting gave very good satisfaction. The other places were smaller towns, but we had some of the most interested audiences that we have ever had in institute work. Poultry and the sheep industry were taken up at two of the institutes, and at the other one poultry, and a lecture by Mr. Van Dreser on the dairy cow. I find that there is very much more interest taken in institutes than before, and quite a number have remarked to me within a year that when we have learned from the institutes to feed our stock at one-half the cost we did a few years ago, we feel well satisfied for all the time spent. The poultry business is not carried on in the county to any great extent, but after Mr. Gowell's lecture at Parkman some said they were going to build hen houses right away, some of the ladies especially. Dairying is carried on to quite an extent. We have two or three creameries. Many are looking forward to obtaining a better class of animals, in a small way, as far as their means will permit.

SAGADAHOC COUNTY.

John F. Buker—We have held in our section the past year two institutes, one at Sagadahoc Grange Hall, Bowdoin, the other at Dirigo Grange Hall, Brunswick. At Bowdoin we had the largest attendance that we had at any institute in the county and from all the farmers who attended I have heard nothing but good reports. It was the universal opinion that it was the best institute that was ever held there. We had Mr. Van Dreser, who has spoken in nearly every county in the State, to speak on dairying. There were people present who had never attended an institute before. I had a man who was working for me for a few days, at the time, and he said that he could not afford to lose the time to attend the institute. I told him that if he did not say after he had heard Mr. Van Dreser that it was worth as much as his half day's pay, I would pay him for the time. After attending the meeting he said, "I got more good than I could possibly have got by remaining and getting my pay for half a day." Our county is a small county, and the interests are divided. It is not purely an agricultural county. Dairying is the leading industry. It is something that at every institute the people want to hear more about. I am still of the opinion that I held last year, that a great deal of the success of the institutes lies with the members of the Board in the counties where they are held. We must have quite an amount of advertising in order to get a crowd. And in every section where you are to hold an institute you must ascertain about the time the people would like to have it, and hold it at about that time, or else you do not get a large attendance. I do not believe that a few dollars on a speaker, as to whether you get the man they want or the man they do not want, is any object at all.

KENNEBEC COUNTY.

A. N. DOUGLASS—The institutes we have held in our county the past year have been well attended. We have sought to extend the work into localities which the Board has not reached before. In some sections of the county the people hardly knew what an institute meant, but they gave a very good attendance, I should judge, for the first one, and after the meeting closed they manifested a good deal of satisfaction. I believe an institute of that kind, where we reach the remote sections, must be of great benefit to the people of that locality. I have always noticed, too, that where we have held an institute once they want us to come again. There is not so much difficulty in the matter of speakers as in the matter of dates. I find considerable difficulty in arranging dates that are satisfactory to all, but have been very successful along that line this year. We had Mr. Buzzell, road commissioner of the town of Fryeburg, to speak on the subject of snow rollers. I was especially impressed with that idea, gained in Mr. McKeen's last report, and also in what I had learned from Mr. Buzzell's talk at the Good Roads meet-

MODEL TIEUP, BARN OF SECRETARY B. W. McKEEN.

ing, and I was determined that the people of the county should know more of it. And while of course no fruit has been borne from the seed we have sown, yet I find very much good will towards the idea, and I believe that it is only a matter of time when many of the towns in the county will try it as an experiment. And I have no doubt but that if they try it as a matter of experiment they will adopt it as a permanent matter of road improvement. I do not know as I can suggest any new line of work. I think the topics discussed have been very satisfactory to all.

PENOBSCOT COUNTY.

CHAS. L. JONES—Coming on the Board as I do, as a new member, and representing Penobscot county, with its large territory and varied agricultural industries, I hardly know what I can say along the line of new methods, and I hardly think it would be advisable for me to suggest any. Of course Penobscot county has agricultural industries all the way from its old worn fields to its farms which have just been reclaimed from the forests. The work which has been carried on in Penobscot county, by the member from that county, with the aid of the efficient secretary of the Board, has been very acceptable. Some sections of our country are more particularly adapted to beef and sheep raising, and I think those industries should receive encouragement. And the matter of getting the soil into mechanical condition which shall make it more productive, should receive more attention in all sections of Penobscot county. The growing of forage crops, and especially clover, I think should also receive more attention. I am in sympathy with the idea which was advanced by Brother Light, in regard to the dairy conference. I think it is well for this Board to consider whether we cannot cut down the expense somewhat there, and do more work in connection with the creameries, in the line of bringing about a better understanding between the patron and the creamery operator.

CUMBERLAND COUNTY.

JOHN W. TRUE—While my county is the largest in the State in population, it is not the largest in farming interests, probably, and the farms in our county, as a rule, need attention. There are many of them, situated around Portland, that have been drained to death by selling hay. The farmers find that that does not pay, and they are beginning to turn their attention to other lines, one of which is private dairying. They are inquiring what they shall do to increase their stock fodders, and are studying up the silo. We want more information on that point, and more education in the line of private dairying. The farmers want to learn how to use the Babcock test and these cultures and separators, and I think if some of the money that has been expended in the dairy conference could be put into dairy schools or dairy institutes, it would reach many dairymen that will not attend the dairy conference. It would seem to me to be a good idea to use some of the money in that direction. The fruit interest also needs a little attention, especially in regard to methods of spraying. I have letters from parties suggesting that we have people at the institutes with spraying apparatus, to show just how these fungicides and insecticides can be mixed and prepared, and the method of applying. The interest in farmers' institutes in our county is not as good as in other counties, I think, but I shall try to work it up and awaken more interest.

AROOSTOOK COUNTY.

CYRUS CHASE—Being a new member I hardly know how to talk on this subject, but I will say that the institutes in our county have been very beneficial. As a rule we get out a crowd and make it a point to ask many questions, and being in a new county, with new land, we have much need of encouragement in farming lines. We are a community that, as you well know, make a great point of raising potatoes. We think that perhaps we can make money a little faster in that way than with a more mixed husbandry, but still I favor a mixed husbandry in our county and a great many at present are going into stock husbandry, they are getting more thoroughbreds. They are also picking up considerably on sheep husbandry, buying thoroughbreds for that.

The people take much interest in the institutes, and the coming year I shall try to be in touch with them and to endeavor to find where the institutes will be the most beneficial and the subjects that they would like, and I would say to the Board that at any time any of you see fit to visit us we shall be glad to have you come and help us along in any lines you see fit. We raise a great deal of clover and I am satisfied that where we can raise clover, and a good crop of it, we can raise almost anything else. Our practice is to plow fine, seed down, perhaps take off one or two crops of grass, and work the ground over again, and we are sure of a good crop of potatoes after it, and then a good crop of wheat or oats, or anything we want to put in, and then we are sure of a good grass crop again. We plow in a great deal of clover, not generally the hay part of it but the roots, and in many places the clover roots will stick up out of the sod some two or three inches. We are sure of any kind of a crop after that.

FRANKLIN COUNTY.

JAMES MORRISON--I am situated about the same as Brother Chase and the other new members. I did not have the pleasure of attending the institutes in our county this last fall, on account of being obliged to be in other places on business, and I know but little about them except from hearsay. So far as I have heard, the institutes in Franklin county gave good satisfaction, and I have no doubt but that a great deal of good was derived from the holding of the same. I am not prepared to state at this time just what our farmers want in that section, except in a general way. I think I understand somewhat the condition of things existing in my county, but I have no special requests to make at this time. As other members of the Board have said, I propose to consult the leading agriculturists in the several towns, before the time for holding the institutes, and ascertain when they want the meetings held, where they want them, and what subjects they want treated. I understand that there is a great need in our county of encouragement in the lines of stock raising and sheep raising. We have had a great deal of education in regard to dairying, perhaps enough in that line. A great many of our farmers are engaged in dairying, and those who live around the large villages and on the lines of the railroad are making money, many of them. And other farmers who live in remote places, away from lines of communication, away from the villages, have in a measure taken the feeling from these people who are prospering, and many of them have gone into dairying when, as I think, they would have done better, on account of their location, to have practiced mixed farming, the raising of stock, sheep, hogs, etc. I was very favorably impressed with the report of the secretary yesterday. He seemed to touch on the very line that, if carried out, would affect our farmers favorably in some sections of our county, in his allusion to the encouragement of beef raising, cattle raising and sheep raising. I think that is just what we want in some sections of the county, perhaps in the larger portion. We want more education and more lectures upon the best methods of raising cattle and sheep, horses and hogs, than we do upon dairying, because there are so many of our farmers who are situated too far from the markets to compete successfully with others who are engaged in dairying and have better facilities. I think it would be a wise thing to have the matter talked up in our county, and to encourage the changing of this native and scrub stock to thoroughbred stock. In order to compete successfully in raising cattle and sheep we want to improve the breeds of stock. We have too many of the old native stock and scrub stock that is not very valuable. A great many of our farmers are engaged in rearing thoroughbred stock and they always get a good price for it, and that is what we need in the county,—encouragement in raising thoroughbred stock and thoroughbred sheep. I am hoping that in the coming year we may be able to hold a large number of institutes in the county, and have this question brought up and discussed.

HANCOCK COUNTY.

NAHUM HINCKLEY—The needs of the farmers in our section can only be reached through the institutes. They need instruction in the matter of renovating their old, worn-out fields. When they can succeed in producing good crops of grass and silage, they can increase their stock and of course there is a market for stock at all times. The question of the worn-out fields is one of the greatest questions in my county; also the production of a money crop. I think that cheese making might be taken up in the county to very good advantage. When I was young I can remember of seeing on my mother's shelf forty or fifty cheese at one time, but now there are hardly any made. The money expended for institutes in our county has been well expended, and the farmers are profiting by it. They are putting in silos, and seem to be taking more interest in their work and putting new life into it. I think a little more money expended in institutes on the dairy question would be very profitable indeed.

WASHINGTON COUNTY.

E. F. ALLEN—I consider that the institutes in our county have been successful. We have held quite a number, the secretary and speakers were in the county a full week, and we had full meetings throughout the county with perhaps one exception. I think the subjects of the renovation of the soil and the importance of keeping more stock and more sheep, are what we need most in our county. I was very much interested in the talk which Dr. Harris gave last night on education and agriculture, and I have thought that perhaps we could have something of that nature for the evening meetings in the larger places, especially in the villages, something that might educate our boys not to go off the farm but to go on to the farm and go to work there. I consider that the boy with a college education is none too good to go to work on the farm, and if we could have that idea impressed on our young people, that that is what they need in farming, and if they get an education it is not going to hurt them and they have not got to go away and get their living somewhere else, I think it would be good for the people.

Mr. LIGHT—I suggested a little while ago in my remarks what I have been thinking about somewhat, and I think it will be no harm for the Board to consider it. I would like to present this motion:

Moved, That the executive committee be instructed to arrange to expend in special dairy instruction, in connection with creamery management or other dairy interests, a sum not to exceed $400 from the institute fund, and that the expense of the dairy conference be reduced an equal amount.

This sum of $400 I fixed without any consultation with anybody. Now if there is anything in this motion that is worthy of consideration I want you to consider it carefully, and fix the sum at $200, $400 or any sum you please. My idea is that the sum named to be used in dairy instruction shall correspondingly decrease the amount that you expend at the dairy conference, so that we shall not use more of the funds in promoting the dairy interests than we are using now, only a part of it shall be used in a different manner.

Voted, That the motion of Mr. Light lay on the table until the afternoon session.

Voted, That the secretary be instructed to send the usual amount of stationery to the members.

Adjourned until 2 o'clock P. M.

THURSDAY, JANUARY 17—AFTERNOON.

Meeting called to order at 2 o'clock. On motion of Mr. Light, voted, that the business laid upon the table at the close of the forenoon session be now taken up. Mr. Light now asked permission to amend his original motion, so that it should read as follows: Moved, that the executive committee be instructed to arrange to expend in special dairy instruction, in connection with creamery management or other dairy interests, a sum not to exceed $300 of the institute fund, and that the expense of the dairy conference shall not exceed $400.

Mr. BUKER—I would like to ask if it would be possible to have a good dairy meeting for $400?

Mr. MCKEEN—As far as I am concerned, I should be very willing and glad to have this motion become a part of the work, because I am willing to try to hold a good dairy conference at a reduced expenditure. I have no doubt but that people in Portland or Lewiston will again interest themselves so that we can get contributions for the work. The $300 will give us six dairy instruction meetings. Four hundred dollars, without money from any other source, would not, in my judgment, hold a dairy meeting that will be a credit to the State, but I am willing to try it.

On motion of Mr. Hinckley,

Voted, That members of the Board pay their own expenses when attending the dairy conference.

Fifteen Minutes' Talks were now given by members, as follows:

MILK PRODUCTION.

By J. L. Lowell, Auburn.

What I may say on this subject may not fully agree with the conclusions reached by modern scientific investigations, but will be from a life long experience in producing and delivering milk to the consumers in the city, this being the specialty followed on our farm continuously for a period of fifty years. We do not wish to be misunderstood, as we do not claim that our way is best, but are always open to conviction, and always looking for something better.

In order to produce milk we must have the animal, or the machine, as we sometimes say. If we purchase these animals, as most of us do, it is very important that we get those that are best adapted and constructed for our special business. One of the first requirements is size. I do not care to have them too large but rather too large than too small, as an undersized cow is very poor property for a milk man. When we put on the strain of high feeding, they are more likely to break down, and a small cow after being overfed or having met with an accident is worth very little for beef, while a large one will bring a satisfactory price. It is our practice to buy the best high grades of the larger dairy breeds, that we can find. As a rule by making a careful canvass of the surrounding towns we have been able to purchase these animals at about $50 per head.

We have had quite good success with high grades of all the dairy breeds and are of the opinion that they are a little more hardy than thoroughbreds, and as we keep them until they are worn out, it is important that they be physically strong and possessed of powerful digestive organs.

FEEDING.

Although I never expect to be able to keep a cow a year on the product of one acre of land, I do not say that it cannot be done. When we consider the results of improved methods in feeding it is useless to predict what the future has in store for the intelligent husbandman.

While it is true that the past century has been the most wonderful in invention and progression that history records, yet we firmly believe that the one we are now entering upon will be still greater, and the agriculturist of to-day will be lost sight of by his more fortunate successor, twenty-five years hence. We are following what seems to be the most natural and what certainly is the easiest way, turning the stock to pasture about the middle of May and allowing them to graze until the cold days of autumn, always keeping in mind that a cow to be at her best must have a full ration of nutritious food. If at any time from drought or any cause they do not get all they require, some green crop or grain must be added. The winter feeding has been so much discussed, that it is useless for me to tell the well read farmers what to feed. We all know that we should feed freely of succulent food, with good hay and grain, to get the best results, and the better the hay and the more grain, up to a certain limit, the more milk we get.

I will now speak of what I think is of the most importance to every dairyman in Maine, and that is the care of the herd, and the handling of the product, for it is this upon which the success or failure of the business depends.

It is known to all, that in order to have the best of anything the greatest care is required and constant attention, and this is true of the dairy more than in any other branch of our business. If we ever receive for Maine butter the same price that is received for New Hampshire and Vermont marks, it will be when we are required by law to keep our stock in the most healthy and cleanly condition.

We believe that all kinds of stock should have out-door air and exercise every day that it is suitable; just for a short time, to fill the lungs with pure air and to prevent them from loosing the use of their legs. I have bought animals in March that had not been untied for the winter that were in good condition, but have been obliged to haul them home because they could not walk.

The best milk that I can put on the market is obtained from a mixed herd of four different grades. The milk is all strained into a large tank and thoroughly mixed, after which it is put into cans and except in cold weather immediately placed in ice water. Milk placed on ice keeps longer and gives better satis-

GATHERING THE APPLES. ORCHARD OF W. P. ATHERTON, HALLOWELL.

faction. I can say from personal experience that the milk from a mixed herd of twenty healthy cows, thoroughly mixed and properly cooled, is the nearest to a perfect food that can be taken into the human stomach, let the person be young or old.

ORCHARDING.

By JOHN W. TRUE, New Gloucester.

Orcharding is something which the first settlers that came into this part of the country brought with them. They brought their apple seeds and planted them, and they came up and grew and bore apples. The kind of apples that they bore was never changed. They were fortunate enough to get something that was eatable and that they could cook, and they were satisfied. Later on, as late as my father's time, the practice of grafting came into use. My father was one of the first to learn to graft in that section. If one had a particularly good seedling that seedling was propagated. We would call some of them very poor apples now, but they used the best that they had. A little later, perhaps 40 years ago, the salesmen of the western nurserymen came around. In many cases they were a detriment to the planter, as the farmers took the trees that were of all kinds and descriptions, poorly grown perhaps, and in many cases it was the cause of orchards being planted. There was one man in our town who had planned to plant an orchard. He thought he would go to some place where he had known of a man's sowing a nursery, as it was called then, and get a lot of these nursery trees and graft them; but the time never came when he could see his way clear to go and get the trees and plant them, and he never started until this western nurseryman came around and wanted to sell him some nursery trees. Then he was all ready to buy, and said he would take one hundred. "What kind do you want?" the nurseryman asked. "I do not know, give me a hundred good trees of some kind." That gave him the chance, of course, to put in all kinds. Some of those trees have borne remarkably well, and have been the source of a great deal of income to him and his son

Coming down to my time, when I went to farming as a young man I knew nothing about it. I had left the farm at nineteen and came back at twenty-six. I could milk a cow, of course, but I had never taken any responsibility, and knew really nothing about farming. They told me I had apple trees enough. If I would take care of what I had it was all I could expect to do. There were perhaps 100 trees on the farm that had been grafted. Later on circumstances arose when I thought it advisable to set out a row of trees. It was a mistake, it was wrong to set them where I did. A row of trees had been set close to the wall on the line fence, and I from a wrong motive thought I ought to set a row on my side, and I did so. Those were the first trees I ever set. I bought ten and took up ten that my father had grafted. The ten I bought were Northern Spies. They were good trees and if I had grafted them in three years I should have been fortunate, but there they are to-day as Northern Spies, and of very little value. They are nearly a foot in diameter,—with immense tops but no fruit. They are thrifty, growing trees. The other ten that I took up were of all kinds, one of a kind. I did not know what they were when I set them out, but I have grafted all but one to Baldwins and they are paying well. I give you these statements as experience; you may take them for what they are worth. I got so interested in trimming and grafting those trees that I soon wanted to try an orchard, but I did not want to give up any good land to orcharding. I had good fields and I did not want to take those. I had two orchards of this old natural fruit, cider apples as they were called, which I thought of no value. I cut those down, took out the stones and set my trees. And there the next mistake came in. I set them only twenty feet apart. They were bought as Red Astrachans, to be grafted with Baldwins. They are now good trees, but too near together. Soon something must be done to thin them out. I consider the Red Astrachan a good stock to graft upon. You get a good limb, well united to the trunk, that will hold an immense load. It is very much preferable to the Baldwin stock. The two tracts comprise about three acres. One of them was set to Baldwins and Ben Davis, and the other to Red Astrachans. My Baldwins have done well, but they show signs of weakness where the limbs unite with the trunk. That I call a fatal weakness of the Baldwin tree from the nursery. I removed all of the rocks, with drills and powder, and fixed it so that I could set my rows straight both ways, and I have been well repaid since for that trouble. I believe in setting them out so that when you go through the orchard you can shut up one eye and see the row.

Not having dressing enough, as I thought, to carry on my ordinary farm operations and dress those trees as I should, I put hogs into one of those orchards, thinking that the trees if they did not grow so fast would make a fair growth; but that failed me. They did not make the growth that I wished, and I took the hogs out and commenced plowing and dressing with barn manure, and in that way I have raised all my trees. I have since set some 400 more trees, at distances of twenty-five and thirty feet apart. Those twenty-five feet apart have been set fifteen years, and it is very comfortable getting around them now, but I can see that thirty feet is preferable. I do not think, with the experience that I have had, that with Baldwin trees it is necessary to go more than thirty feet. I feel that it is necessary to cultivate the land, and if they are set thirty-five or forty feet apart you have to cultivate more land a longer number of years, perhaps, than your manure pile will warrant. My thirty feet orchards I think are right now, but the time has come when I have got to do something else for a fertilizer, with those large trees. I cannot plow and cultivate as I did when they were small. I will say here that in cultivating those trees when they were small I got my pay as I went along. The other crops paid all the bills for quite a number of years, ten years in most instances and in one case twelve years. I considered that the crops paid, although the last two years I could see that the trees were an injury to nearly half of the land.

This fertilizer question now presented itself to me to solve. I have perhaps a half-dozen trees in a chicken yard, as we call it, where the hens and chickens roost, but that evidently is not the kind of fertilizer that they need. I have another orchard for which I have bought hard wood unleached ashes, and I would like to show you the difference in two apples which I brought with me, both Baldwins, one raised in the chicken yard, which is poorly colored, diseased, not a good keeper, coarse and worthless, the other raised in the orchard fertilized with hard wood ashes, smooth and highly colored. The trees in the chicken yard are as well trimmed as the others, and they are more thrifty and bear larger leaves, but the apples are never well colored.

Ques. Is there any difference in the locality of those trees in regard to the sunlight reaching them?

Ans. I think not; they are all on high, rocky land. The apples in the orchard fertilized with hard wood ashes, as a rule, are very high colored. It may not all be due to the ashes, but I think that has a great deal to do with it.

Ques. What stock were they grated on?

Ans. Those in the chicken yard were on Red Astrachan, and the others came from the nursery.

In trimming trees it seems to me that it should be commenced, like the training of a child, when they are very young. You should have in mind just what you want to do. You should have in your mind's eye just the effect that taking out a limb will have, and just how you want to shape the tree. My idea is that it should be very nearly in the form of an umbrella, the limbs being the braces. In taking out a limb never leave a hole in the top. Leave it symmetrical, and have all the apples possible exposed to the air and sunlight. I think this can be done in almost every case. If you leave a hole you let the sunlight strike on to the large branches, and I think it injures the wood.

In regard to varieties, for the present the Baldwin is our great market apple. It has many good qualities. It is a good bearer of good, marketable apples, with very few small ones. Its keeping qualities are good. If a tree stands in a bad place, in an old lot and uncared for, if it bears any apples as a rule they are marketable apples. It is not as hardy as we would like to have it, but it is known the world over, which is one thing in its favor. Then there is the Ben Davis, which, in my opinion, is a good marketable apple. It arrives on the market in good shape and late in the season will bring a good price. But it wants extra cultivation to get good marketable fruit, as it soon runs small.

If we could raise more apples or if we could raise apples with the good qualities of the Baldwin, and in addition to that a good flavor and texture and a good heart, it seems to me that the consumption of apples would be immensely increased. Many more would be called for and the market would be broadened.

In relation to the marketing of fruit, one of the things that I proposed to call your attention to is the subject that was brought up this forenoon by Mr. Roberts, that we should be in communication with all parts of our own country, at least, and know the extent of the fruit crop, and the kinds of apples that compose that crop, and bring the prospects to the attention of all fruit growers in Maine. Perhaps that can be done through the Board of Agriculture, as was outlined this forenoon.

One other thing,—it seems to me that somebody should put his brains into devising some package that shall hold a peck or half a bushel, that will go with the apples. If we can get an apple like the McIntosh Red, or some other apple of nice quality, the basket or box crate to go with the apples, it would seem to me as though it would increase the consumption of apples and the call for a nice quality of apples. We can see that in the grape industry. Grapes are brought to this State by the carload and sold in baskets, when if they were weighed out by the pound it would curtail the consumption more than one-half.

Ques. Do you prefer Red Astrachan stock to graft upon to the Ben Davis?

Ans. I do, to graft the Baldwin on.

Ques. How is the Bellflower?

Ans. That would be good. The Bellflower is a quick growing stock, and the Ben Davis is rather the reverse. I should prefer, however, to graft either on the Red Astrachan or Northern Spy. There is nothing better than the Northern Spy stock, in my opinion, to graft from into anything.

BEEF PRODUCTION.

By Arthur N. Douglass, Chelsea.

I feel quite inadequate to treat even so briefly the important subject assigned me. I believe this industry may be successfully followed by many farmers who are favorably situated and naturally adapted to this branch of agriculture. Stock raising in some form has long been conceded to be necessary to the successful practice of farming. Dairying offers many inducements to those who are inclined to that industry, but a vast amount of labor is necessarily involved which to a large degree is obviated in the production of beef.

It needs no argument of mine to prove that an ordinary scrub, in whose veins flows a sprinkling of the blood of almost every known breed, can never be profitably raised and turned into beef. Neither do I plead for the thoroughbred as being invariably the most remunerative. Oftentimes the thoroughbred animal of every breed has its pedigree to recommend it and that is about all. I believe the intensely beef types are not sufficiently hardy to withstand the rigors of our climate. Consequently the exercise of wisdom in the crossing of breeds, contributes a great deal to the successful production of beef in Maine. In my judgment the Herefords have the largest claim to our attention as being well adapted to this line of business. They are hardy, and well and solidly built. Their flesh furnishes fine flavored and juicy steaks, and best of all, they mature early.

The result of my observations has been to show that an animal intended for beef will make a greater gain in weight at a less cost per pound, prior to reaching two years of age than later. Calves for veal may be started on whole milk, gradually changed to skim-milk and finally finished off with whole milk for a week or ten days to give them a smooth appearance and improve their sale. In a number of careful trials reported at the Massachusetts Experiment Station, calves gained one pound in weight from ten to sixteen pounds of skim-milk. Whole milk calves cost too much as a rule, yet it is well, if possible, to give them the whole milk for the first four weeks. After that feed them a gradually increasing ration of oatmeal to balance the skim-milk. The Iowa Station, which has given particular attention to calf feeding, reports that the mixture producing the greatest gain at the least cost was found to be nine parts corn meal to one part flax meal, and one pound of this mixture was used with eighteen or twenty pounds of skim-milk to each calf per day, the meal being later increased to two pounds a day. Grade Shorthorn calves thus fed made gain at a cost of from one to two cents a pound, the skim-milk being rated at fifteen cents per hundredweight. Started on such a ration the milk was gradually withdrawn after the first one hundred days, and these calves reached an average weight of 760 pounds when one year old, or a gain of 660 pounds in that period. Too much emphasis cannot be placed on the importance of giving calves intended for beef stock a good start while young.

We have at our farm at present a ten-months-old grade Durham, that was given a small quantity of whole milk until he was two months old. At five months he was given a good pasture. In November he came to the barn and has since been fed good hay, supplemented during the last three weeks by 1½ quarts of corn meal per day. He now tips the scales at 530 pounds and I have no doubt that with forcing he could have weighed fifty or seventy-five pounds more. With good pasturage the coming summer he ought to weigh 800 pounds next fall.

Farmers in Maine in the production of beef stock must depend mainly upon the proper breed and good pastures wherein great gains may be made during the summer. I believe a bright future is opening up for this industry.

FAIR MANAGEMENT.

By NAHUM HINCKLEY, Bluehill.

I feel that I am unable to treat this subject in such a manner as may be interesting and profitable to you, but as our worthy secretary assigned to me the topic, I shall in a brief way impart to you some of the ideas I have of fair management. Our society, of which I have been secretary from the date of its organization, is situated fourteen miles from any railroad station, therefore we are unable to draw attendance from the large business centers of the State. The waters of the ocean form the southeastern side of our town. Therefore, you will see that we are not favorably situated so that we can get a large attendance. To start with, the selection of our grounds was excellent. I do not know of a half-mile track in the State that is naturally as level, or in as pretty a location. Standing on the track, you can see a horse's feet from start to finish. We avoided one of the errors often made, by locating the grand stand close up to the track fence. The judges stand directly opposite, in a similar position, so that the judges' announcements are easily heard. Next is a good fence, eight to nine feet high, with horse stalls and cattle sheds, making a good equipment. Next in importance is the advertising of the fair. Starting in in my own town, I personally (for we have been too poor to hire) fold and direct to every household in town, one or more of the premium lists, beginning at the ending of a road, at the town line, and calling to mind each house, until the other end of the road is reached, and so on all over the town. To bill surrounding towns, I send the advertising matter to the post offices and stores, with a complimentary ticket, and ask them to distribute. In arranging premiums, we started in with too high trotting purses. In the last three years we have reduced the size of the purses, so that it no longer draws the class of *professional* horse racing men, and have twice added an increase to premiums offered for farm products and stock. We also allow a mileage for stock that is driven more than five miles which draws no premium. It is a good idea to enlist the aid of a few to solicit exhibits, and to assist in distributing premiums. All of the employes and assistants should be selected for their especial fitness for the position in which they are to serve. For three years we have offered a premium for the best grange exhibit, and have allotted a space by itself for this purpose, and we have never failed to get a large exhibit and a display of old household articles, many of them a hundred or more years old. In the last exhibit there were curios from Japan. The selection of awarding committees is of great importance. They should be selected some months before the date of the fair, and should be selected for their adaptability in each department. They should be of good judgment and above showing prejudice or partiality in their awards. Among the many articles are some of decided merit for which no premium has been offered. These the awarding committee should enter for a gratuity, to which the directors should affix a premium worthy of the article. The ground rents should be as low as the finances of the society will admit, so as to attract that large body of people who follow up the fairs, as fakirs, cane stands, peanut venders, lemonade stands,—in fact, anything, except the sale of intoxicating liquors and gambling. And wise indeed is the management if they are able to prevent pocket peddling, also to prevent the man who carries a short piece of board under his arm, on which at a moment's lack of vigilance, he will start a shell game. Advertise tenting grounds for families, free. It is a growing custom for people to tent out at fair time. Admissions should be as low as possible, a reduction to large families of children, no entrance fee to be charged on exhibits, the usual entrance fee for trotters and draft oxen. The police service should be of the best, with no man on the force who takes spirituous liquors. I have noticed that a man half *full* makes a very poor officer, and always adds to a disturbance instead of diminishing it. The stock department manager should be provided with an assistant, who should haul a load of hay by all stalls at feeding time, leaving an ample quantity at each. Allowing everybody to feed is wasteful and expensive. The practice of some societies who expend large sums of money for special attractions, sometimes at the expense of the premiums which have been honestly awarded, is rather to be condemned than commended. The attempt to convert a country fair into a second-rate circus, is unwise, and contrary to the spirit of the law under which the societies were organized. Therefore, endeavor to hold an old-fashioned country fair, and the people will come to meet their neighbors, their cousins, aunts, uncles and sweethearts, and they will go home satisfied, having had a social time, and at a very slight expense.

OUR CANNING INTERESTS.

By John M. Winslow, Nobleboro.

The canning industry of our State is much larger than most men would think until they had looked into the matter pretty closely. I am indebted to the commissioner of industrial and labor statistics for the figures which I herewith present. About the year 1840, Isaac Winslow began to make experiments in canning corn near Portland, Maine. Previous to 1840 he was engaged in the whaling business. It was during his visits in France that he learned of the process of preserving food by canning, and he conceived the idea of preserving green vegetables by hermetically sealing them in cans. In 1842 Mr. Winslow arranged with Caleb Jones, (a brother-in-law, and father of John Winslow Jones who was at one time king of the canned goods trade in Maine), to plant a piece of corn for experimental purposes. The first corn canned was canned cob and all. Then came the cutting from the cob by hand, then gradually machinery took the place of hand work, until now nearly all the work is done by machinery. The number of acres planted to sweet corn under contract for the supply of the canning factories in 1899 was 11,050, and the amount of money paid to farmers for corn was $331,500. There was packed in Maine in 1899, 22,100,000 cans of corn. This pack of corn at the prices quoted would be worth $1,519,374.45. It takes from three to six weeks to complete the pack of corn, and it takes about 7,000 men and women to run these factories, not to speak of the huskers, the men engaged in harvesting, and the teams at work hauling it to the factories. The total amount paid in wages in 1899 was about $349,000. The factories, of which there are about 70, are worth at least $500,000. In 1899 it took 6,185,190 pounds of tin plate to make the cans, and in order to properly comprehend the great canning industry you must go even into the mines, as it takes, in addition to the large amount of tin plate, thousands of tons of coal to carry on the business. It is a business that should be fostered and encouraged in our State by the farmers. They should not allow this large output of capital to go out West. I believe it is one of the best crops the farmer can raise, when the factory is within three or four miles of his farm, at two cents per pound, and a fair crop at one and one-half cents per pound, the present price, in most instances. The agricultural interests of this State are worth fostering and building up, for on them depend so many other branches of business. And surely the canning industry should be fostered and encouraged by the farmers so long as they can get as good prices for their product per acre as they can get in other markets. Nearly all kinds of vegetables are canned, and large quantities of apples. The possibilities in the canning business in Maine are great. The canning of blueberries is all done in Washington county and has become a large business. In 1899 five factories, all that were in operation at that time, packed an aggregate of 39,000 bushels, costing at the factory $50,000. The entire pack when sold at the prices quoted at that time was worth $104,000. In 1899 there was paid to the pickers $31,000. The canning of sardines in our State is no small business. In 1899 (being the year in which I get these figures) there were sixty-eight factories in operation in Maine, the total pack was 1,170,568 cases, the value of which was $3,253,076. From these figures we can get some idea of the importance to the State of the canning industry, as there are thousands of acres of land to be tilled this season for the canning factories and thousands of farmers are to do the work (I speak now more especially of corn). It gives employment each year to large numbers and the result is a good cash crop to be sold in New York, where most of it is sold; and we have impoverished the soil but little, as the most of the manurial value of the plant is in the fodder left to be fed on the farm and the farm will carry more stock than it would were it all in grass.

THE PRODUCTION OF CATTLE FOODS.

By S. H. Garvin, Acton.

In considering the production of cattle foods, the grasses must come in for the most important consideration, as they are by far the most important and universal cattle food for the farmers of Maine. Of these timothy is the leader, followed closely by redtop and the clovers. Corn fodder, either in its dry state or as silage, is also important, and as silage it is coming rapidly to the front and is likely to take first rank as a cattle food among the most progressive of our farmers, not only for its intrinsic value as fodder but on account of its quick growth, as worn-out land may be made to produce an abundant crop in about three months time. Oats and barley, either alone or with peas, are valuable foods and should receive some attention from the progressive farmer.

With myself and most of my farmer neighbors the usual practice is to mow our grass fields as long as they produce a fair crop of hay. Probably we mow them too long. Then we replow them, planting one or two years and reseeding, sowing grass seed,—timothy, clover and redtop, with oats or barley, which are cut when the grain is in the milk and cured for fodder. We do but little threshing, believing it more profitable to feed whole than to pay the cost of threshing.

We usually plow the sward land in the fall, let it lie in the furrow till spring, then draw on eight or nine cords of barn manure per acre, harrow till thoroughly pulverized, using a spring harrow, and plant to yellow corn, usually with about 300 pounds of some standard brand of superphosphate per acre.

Shock the corn when it is fairly well glazed, putting 20 or 24 hills in a shock, and when dry, which will be in two or three weeks, draw to the barn and husk out the ears and pack the fodder away for winter use. If properly cured and cared for, I consider it one of the most valuable cattle foods, and as a milk producer more valuable than timothy hay and exceeded only by well-cured clover.

After the corn is removed from the field the field is again lightly manured, if we can afford it, well plowed and again allowed to lie all winter in the furrow. In the spring it is harrowed and again plowed. This thoroughly pulverizes the manure, which may have been lumpy, and mixes it well with the already pulverized soil, leaving the ground in excellent condition for a seed bed.

I frequently depart from this method, and one of my most satisfactory experiments was in increasing my hay by the use of superphosphate as a corn producer. Several years ago, while repairing my buildings, I somewhat neglected my farming and soon found a decided shortage in my hay crop. So I looked for a remedy and adopted the following plan. I took the least productive field I had, one producing not over 500 pounds of hay per acre, plowed it in the fall and let it lie in the furrow till the following spring. It was then thoroughly harrowed down and pulverized and at planting time furrowed out with a Centennial cultivator 3½ feet apart, 600 pounds of superphosphate per acre sown in the furrow, and the corn dropped in rows running crosswise, making checks 3½ feet apart each way.

As soon as the corn could be seen the cultivator was started and run alternately each way as often as necessary. In this way very little hard work was required. A few weeds among the corn, or a little grass if the land is full of witch grass, is all that the hoe has to remove. The cultivator was kept going till into July, and when haying began to rush us the corn was left to finish its growth. It was then so large that it shaded the ground so weeds and witch grass made but little growth and the hot sun did not bake the top soil and form a crust.

When the ears were well glazed and the fodder began to turn it was shocked, 20 hills to a shock, a band put around the tops to hold it firm, and it was left to stand till sufficiently cured to keep well. It was then husked and stored for winter use.

In this way I got from that worn-out field corn stover that I considered as valuable as two tons of timothy hay per acre, and 90 to 100 bushels of ears of corn. And I consider 100 pounds of good Maine-grown corn, ground with the cob, as valuable for feeding purposes as 100 pounds of clear Western meal. For horses I would rather have it.

As soon as the corn was off, the summer manure was hauled out and spread as far as it would go and make a good coat, the land plowed and allowed to lie in the furrow till the following spring. In the spring the rest was manured, the ground harrowed with a spring harrow to level the furrows, and just before planting time the land was again plowed and put in good condition for the seed.

This year one-half of the piece was sowed to oats, two bushels per acre with twelve pounds clover and one-half bushel timothy, and an abundant crop of oats harvested for fodder, followed the next year by a heavy growth of clover, after which the timothy came in. The other half was planted to corn again, using 300 pounds of superphosphate per acre, cultivated level and after the last working the grass seed sown among the corn, using the same amount of seed in each case. In sowing grass seed among corn, if the season is wet and rain follows the sowing within a few days the seed will be sufficiently covered by the rain. If the season is dry it should be lightly raked or brushed in. The grass seed came up well and when the corn was shocked was about four inches high and the ground was well covered. One great advantage in raising corn on superphosphate is the absence of weed seeds, which are always abundant in barn manure, and the consequent saving of labor in killing weeds. And I think with our improved tools, and allowing a fair amount for the value of the stover, corn can be raised in Maine as cheaply as Western corn can be bought in the market, and the sooner we realize the fact the better it will be for us. I wish here to say a good word for seeding to grass with the corn. The ground is kept level and the seed sown at the last working, say about the 4th of July. From this time on the ground is partially shaded by the corn, but the shade is not so dense as to prevent the growth nor the corn so thick as to kill out the grass seed, and the shade is continued till after the August drought, and when the corn is removed the days have shortened and the weather become cool, so we avoid the danger of the tender grass being burned out by the hot, dry weather, as frequently occurs when the oat or barley crop is removed earlier in the season.

I think seeding with the corn has advantages which no other method has, and when properly done I have never failed to get a good catch. Try a small plot some time and see if you do not like it.

Of the grains, oats and barley, I prefer the oats as a fodder crop. They produce more fodder and are free from the long, sharp beard of the barley. It should be sown early if grass seed is sown with it, as the cool, damp weather of spring is favorable to a good catch of the grass seed, also the grain will be ready to cut earlier, while the weather is more favorable for curing it. It should be cut one day and the next afternoon raked and put into bunches to cure. Let it stand in the bunch till the moisture is well on the outside, then shake out and air and sun well, and it is ready to house. A little salt improves it and cattle eat it readily, including all the larger stalks. It is generally best to feed it early in the winter, or if you have rats and mice they will get in and destroy some of it.

Hungarian is a valuable forage crop and should have a place on every farm. It is pre-eminently a hot weather plant and should not be sown till settled warm weather, usually from the fifth to the middle of June. Three pecks of seed to the acre is about right. If sown too early it is slow in coming up, looks yellow and sickly and makes but little growth till the weather is suitable, while the weeds get a vigorous start and choke and injure the Hungarian all through the season and at harvest you have more rank weeds and less Hungarian than you want. It should be sown on a warm, fine, well-manured soil, and cut when most of the heads are well out and before the stalks get woody. This crop is the hardest to cure of any of the fodder crops, as it contains an abundance of moisture and comes off late when the days have shortened considerably and the hottest sun has gone by. But it is valuable, as it produces an abundant crop of excellent fodder and the harvest comes after the rush of haying is over and we have more time to devote to curing it.

Of silage and the silo I have no experimental knowledge. I have never had one, but have no doubt of their value and usefulness in short hay years like the two past seasons. I think they are here to stay and will increase and be the means of increasing the amount of stock kept on the farm. But of all the cattle foods, clover and the grasses must always be the main dependence of the farmer.

We all like clover, it makes such a toothsome food and is such a good milk producer, besides leaving the ground in such good condition for the succeeding crops. I think it leaves as much in the land as it takes out, so that the land will continue to bear grass as many years after a crop of clover without replowing as it would if the grass had immediately followed the grain.

Of all the grasses timothy is most generally grown. It is a good producer, holds out well and every farmer knows its feeding value. It should be cut in good season or, if rank, the stalks get hard and woody and are not relished so well by the cattle.

Redtop on suitable land is valuable. It does best with us on moist land. It has the advantage of holding green longer than the other grasses and will stand several days after it is ready to cut without apparent deterioration.

We have also considerable swale grass that grows along the low valleys of brooks and rivers and on land too wet to be plowed. It is of second or third quality but all it costs is the harvesting. The land, after it is cleared, bears continuously for generations. This hay is valuable to use in connection with upland hay and young cattle will winter well on it if fed a small amount of grain. It is well worth its cost, as it not only supplements the good hay but adds materially to the manure pile and through that increases the upland product. All such sources of cattle food should be looked after and utilized.

In conclusion we say, raise all the hay you can, it is the standard food. Use every means to keep up the fertility of the farm. Turn the sward over and reseed often; do not be afraid of plowing the land too much, it lets in the sun and air and helps break down the soil particles and set free the fertilizers bound up in the soil. Supplement the hay crop by every means available. Increase the manure by a liberal use of absorbents. Plant largely of corn, it produces both stover and grain and is a sure crop and stands the drought better than any other crop, and with our good cultivators and weeders we can handle a large area.

Seed with oats, barley, Hungarian or oats and peas, and with due care, diligence and foresight we can be assured of a good amount of cattle food to be turned into milk, butter or beef or to increase the number of steers and heifers we are raising for the market.

ABSTRACT OF CATTLE COMMISSIONERS' REPORT.

The Cattle Commissioners' Report for 1898 gives number of cattle condemned and destroyed as 48, at an appraisal of \$1,520.00, and 34 horses at an appraisal of \$1,420.00, the total appraisals for the year being \$2,940.00.

There have been during the years 1899 and 1900, 363 animals destroyed, including cattle and horses; 114 cows and hogs during 1899, 165 cows during year 1900; 38 horses during 1899, 46 horses during 1900, making the total for two years 363 head at a total appraisal of \$15,294.50, one-half of which to be paid by the State, \$7,637.25, or \$21.04 per head.

The report shows a large increase in the business within the last two years over the year 1898.

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

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

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

Anthrax, foot and mouth disease, hog cholera and several other diseases that are considered contagious that afflict animals in other states have not made their appearance in Maine during the year.

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

HOW THE WORK IS DONE.

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

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

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

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

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

TUBERCULIN TEST.

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

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

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

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

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

Nearly 25,000 cows have been shipped out of Maine into the markets of these states during the years of 1899 and 1900, selling upon an average of $40 each, bringing to the farmers of our State nearly one million of dollars. This, in connection with nearly eight millions of dollars worth of dairy products produced from our dairy herds these last two years and nearly all sold in the New England markets, should stimulate the farmers of our State to a higher appreciation of our dairy interests and to realize the fact that no higher qualification could be stamped upon our dairy products than for the consumers to know that they are produced from healthy herds.

What remedies can be applied to hold in check or eradicate tuberculosis among our herds? When we take into consideration that we have at present only 2 1-2 or 3 per cent diseased, it seems almost insignificant, yet it is far too many when we take into account the importance of our live stock interests and the value of a reputation that our herds are above suspicion. The importance of the work of the Maine Cattle Commissioners should be expressed by every good citizen, whether he be producer or consumer.

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

GLANDERS.

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

The disease has been found in different sections of the State, and does not seem to be confined to any breed or class of horses. The veterinarians of the State should be quick to recognize this insidious disease and prompt to report it to the ocmmissioners. The public should be alive to the importance of eradicating it, it being considered more dangerous to man than tuberculosis, and at least not give it a chance to spread.

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

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

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

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

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

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

In summing up the whole situation in relation to tuberculosis among our herds, we must say that the business is on the increase showing over twice as many cattle and horses destroyed in 1899 as in 1898, and nearly three times more in 1900. These are the facts in the case.

Some one may ask, "Is tuberculosis increasing in our State?" This would be a hard question for the commissioners to answer. There are two reasons that we might give: First, that herd owners are realizing more the importance of keeping their herds clean and healthy. Second, that the owners have become better acquainted with the results derived from tuberculin tests, and are placing more confidence in its use. The testing lies entirely in the hands of the owners themselves, and there have been several large herds tested during the past year, some proving to be entirely sound, others have proved to be partially diseased, and it is our opinion that breeders of registered stock are becoming more careful in regard to the health of their herds.

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

SIXTEENTH ANNUAL REPORT

OF THE

Maine Agricultural Experiment Station

ORONO, MAINE,

1900.

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

Agricultural Experiment Station,

Orono, Maine.

STATE OF MAINE.

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

SIR:—I transmit herewith the Fifteenth Annual Report of the Maine Agricultural Experiment Station for the year ending December 31, 1900.

CHARLES D. WOODS,
Director.

ORONO, Maine, December 31, 1900.

MAINE

AGRICULTURAL EXPERIMENT STATION

ORONO, MAINE.

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WELTON M. MUNSON	*Members of the Station Staff*
GILBERT M. GOWELL	*Members of the Station Staff*
GILMAN A. DREW	*Members of the Station Staff*

THE STATION STAFF.

THE PRESIDENT OF THE UNIVERSITY.

CHARLES D. WOODS	*Director*
JAMES M. BARTLETT	*Chemist*
LUCIUS H. MERRILL	*Chemist*
FREMONT L. RUSSELL	*Veterinarian*
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EDWARD R. MANSFIELD	*Assistant Chemist*
CLIFFORD D. HOLLEY	*Assistant Chemist*

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ANNOUNCEMENTS.

THE AIM OF THE STATION.

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

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

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

INSPECTIONS.

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

STATION PUBLICATIONS.

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

CORRESPONDENCE.

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

Agricultural Experiment Station,
Orono, Maine.

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

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

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

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

Remittances should be made payable to the undersigned.

CHAS. D. WOODS, *Director.*

FEEDING STUFF INSPECTION.

CHAS. D. WOODS, Director.

J. M. BARTLETT, chemist in charge of inspection analyses.

CHIEF REQUIREMENTS OF THE LAW.*

The points of the law of most interest to dealer and consumer are:

Kinds of Feed coming within the Law. The law applies to *all feeding stuffs except* hays and straws; whole seeds and meals of wheat, rye, barley, oats, Indian corn, buckwheat and broom corn; brans and middlings *not mixed with other substances,* but sold separately, as distinct articles of commerce.

Inspection tax and tag. To meet the expenses of inspection, a tax of ten cents per ton must be paid to the Director of the Maine Agricultural Experiment Station. On receipt of the inspection tax, the Director of the Station is required to furnish a tag stating that all charges have been paid. This tag, which bears the Director's signature, shows that the tax has been paid but is *not a guarantee of the quality of the goods.*

The brand. Each package of feeding stuff included within the law shall have affixed the inspection tax tag and shall also bear, conspicuously printed; the number of net pounds contained in the package, the name or trade mark under which it is sold, the name of the manufacturer or shipper, the place of manufacture, the place of business or manufacture or shipper, the percentage of crude protein, the percentage of crude fat. These statements may be printed directly on the bag, on a tag attached to the package, or on the back of the inspection tax tag furnished by the Director of the Station. The quality of the goods is guaranteed by the manufacturer, importer or dealer, *and not by the Station.* The samples collected and analyzed by the Station show whether the goods are up to guarantee or not.

The goods must carry the inspection tax tag and the brand before they can be legally offered for sale in the State. It will not answer to affix tags at the time the goods are sold.

Analysis. The Director of the Station is required to collect and analyze each year at least one sample of each of the brands of Feeding Stuffs coming within the provisions of the act; and publish the results, together with related matter, from time to time.

* The full text of the law will be sent on application.

MANUFACTURERS AND PLACE OF SAMPLING.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8841	J. E. Soper & Co	Boston, Mass	Kennebunk
8687	J. E. Soper & Co	Boston, Mass	Newport
8842	Doten Grain Co		Calais
8688	Chapin & Co	St. Louis, Mo.	Hiram
8689	Chapin & Co	St. Louis, Mo.	Bath
8690	Chapin & Co	St. Louis, Mo.	Skowhegan
8691	Chapin & Co	St. Louis, Mo.	Dexter
8692	Chapin & Co	St. Louis, Mo.	South Brewer
8693	Chapin & Co	St. Louis, Mo.	Bangor
8694	Humphreys, Goodwin & Co	Memphis, Tenn	Monmouth
8677	E. B. Williams & Co	Memphis, Tenn	Bluehill
8676	E. B. Williams & Co	Memphis, Tenn	Portland
8695	E. B. Williams & Co	Memphis, Tenn	Lewiston
8696	E. B. Williams & Co	Memphis, Tenn	South Brewer
8697	E. B. Williams & Co	Memphis, Tenn	Bangor
8698	E. B. Williams & Co	Memphis, Tenn	Bangor
8835	E. B. Williams & Co	Memphis, Tenn	Belfast
8699	Humphreys, Goodwin & Co	Memphis, Tenn	Auburn
8700	F. W. Brodé & Co	Memphis, Tenn	Portland
8701	F. W. Brodé & Co	Memphis, Tenn	Westbrook
8702	F. W. Brodé & Co	Memphis, Tenn	Bowdoinham
8703	F. W. Brodé & Co	Memphis, Tenn	Gardiner
8704	F. W. Brodé & Co	Memphis, Tenn	Brunswick
8705	F. W. Brodé & Co	Memphis, Tenn	Bethel
8836	Arlington Oil & Fertilizer Co	Georgia	Belfast
8840	Arlington Oil & Fertilizer Co	Georgia	Winterport
8766	The American Cotton Oil Co	Little Rock, Ark	Corinna
8707	The American Cotton Oil Co	Little Rock, Ark	Foxcroft
8708	The American Cotton Oil Co	Little Rock, Ark	Hampden
8709	The Southern Cotton Oil Co	Little Rock, Ark	Dexter
8710	Paris Flouring Co		Bangor
8711	Unknown		Freeport
8714	Unknown		South Paris
8712	Unknown		Augusta
8713	Unknown		Augusta
8715	Unknown		Dexter
8716	Unknown		Bangor
8717	Unknown		Bangor
8718	Unknown		Bethel
8719	The Glucose Sugar Refining Co.		South Brewer
8720	The Glucose Sugar Refining Co.		Bucksport
8721	The Glucose Sugar Refining Co.		Foxcroft
8722	The Glucose Sugar Refining Co.		Corinna
8723	The Glucose Sugar Refining Co.		Newport
8724	The Glucose Sugar Refining Co.		Biddeford
8725	The Glucose Sugar Refining Co.		Bridgton
8726	The Glucose Sugar Refining Co.		Augusta
8727	The Glucose Sugar Refining Co.		Brunswick

ANALYSES OF SAMPLES.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Cotton Seed Meal	46.50	43.00	12.12	9.00	8841
Cotton Seed Meal	44.40	43.00	13.07	9.00	8687
Cotton Seed Meal	43.69	No guar.	12.04	No guar.	8842
Cotton Seed Meal	43.69	43.00	13.66	9.00	8688
Cotton Seed Meal	44.75	43.00	10.49	9.00	8689
Cotton Seed Meal	43.69	43.00	13.86	9.00	8690
Cotton Seed Meal	45.19	43.00	10.20	9.00	8691
Cotton Seed Meal	45.06	43.00	12.07	9.00	8692
Cotton Seed Meal	45.81	43.00	9.46	9.00	8693
Cotton Seed Meal	45.06	43.00	9.27	9.00	8694
Cotton Seed Meal	43.00	42.00	10.63	8.00	8677
"Daisy Brand" Cotton Seed Meal	43.00	43.00	12.10	9.00	8676
"Daisy Brand" Cotton Seed Meal	45.31	43.00	8.96	9.00	8695
"Daisy Brand" Cotton Seed Meal	45.06	43.00	11.53	9.00	8696
"Daisy Brand" Cotton Seed Meal	44.31	43.00	10.76	9.00	8697
"Daisy Brand" Cotton Seed Meal	44.56	43.00	11.52	9.00	8698
"Daisy Brand" Cotton Seed Meal	45.88	43.00	10.87	9.00	8835
Dixie Brand Cotton Seed Meal	44.94	43.00	8.29	9.00	8699
Owl Brand Cotton Seed Meal	44.31	43.00	11.88	9.00	8700
Owl Brand Cotton Seed Meal	44.06	43.00	13.68	9.00	8701
Owl Brand Cotton Seed Meal	37.31	43.00	18.85	9.00	8702
Owl Brand Cotton Seed Meal	45.06	43.00	11.91	9.00	8703
Owl Brand Cotton Seed Meal	43.19	43.00	11.67	9.00	8704
Owl Brand Cotton Seed Meal	44.44	43.00	12.03	9.00	8705
Cotton Seed Meal	44.63	43.00	8.69	9.00	8836
Cotton Seed Meal	44.94	43.00	10.88	9.00	8840
Prime Cotton Seed Meal	41.69	43.00	10.19	9.00	8706
Prime Cotton Seed Meal	43.19	43.00	10.35	9.00	8707
Prime Cotton Seed Meal	42.31	43.00	10.96	9.00	8708
Prime Finely Ground Cotton Seed Meal	45.56	43.00	11.17	9.00	8709
Prime Memphis Cotton Seed Meal	42.69	43.00	13.66	9.00	8710
Cotton Seed Meal	43.31	42.00	11.80	8.00	8711
Cotton Seed Meal	39.06	42.00	14.06	8.00	8714
Cotton Seed Meal	43.44	No guar.	12.83	No guar.	8712
Cotton Seed Meal	45.31	No guar.	11.68	No guar.	8713
Cotton Seed Meal	45.81	No guar.	11.81	No guar.	8715
Cotton Seed Meal	43.56	No guar.	14.10	No guar.	8716
Cotton Seed Meal	43.69	No guar.	13.78	No guar.	8717
Sea Island Cotton Seed Meal	25.69	No guar.	6.56	No guar.	8718
Chicago Gluten Meal	36.31	38.00	4.57	2.00	8719
Chicago Gluten Meal	32.81	38.00	4.15	2.00	8720
Chicago Gluten Meal	33.31	38.00	4.15	2.00	8721
Chicago Gluten Meal	34.56	38.00	4.21	2.00	8722
Chicago Gluten Meal	35.19	38.00	4.15	2.00	8723
Chicago Gluten Meal	34.56	38.00	4.08	2.00	8724
Chicago Gluten Meal	35.44	38.00	3.43	2.00	8725
Chicago Gluten Meal	32.94	38.00	4.28	2.00	8726
Chicago Gluten Meal	35.06	38.00	4.12	2.00	8727

MANUFACTURERS—Continued.

Station Number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8728	The Glucose Sugar Refining Co.	....	Auburn ....
8729	The Glucose Sugar Refining Co.	....	South Paris ....
8730	The Glucose Sugar Refining Co.	....	Winthrop ....
8731	The Glucose Sugar Refining Co.	....	Belfast ....
8732	The Glucose Sugar Refining Co.	....	Rockland...........
8733	The Glucose Sugar Refining Co.	....	Bath ....
8734	The Glucose Sugar Refining Co.	....	Pittsfield ....
8735	The Glucose Sugar Refining Co.	....	Portland ....
8736	The Glucose Sugar Refining Co.	....	Stroudwater ....
8737	The Glucose Sugar Refining Co.	....	Skowhegan ....
8738	Charles Pope Glucose Co	....	South Brewer......
8739	Charles Pope Glucose Co	....	Camden ....
8740	Charles Pope Glucose Co	....	Lewiston ....
8741	Charles Pope Glucose Co	....	Brunswick ....
8742	Charles Pope Glucose Co	....	Gardiner ....
8743	Charles Pope Glucose Co	....	Freeport ....
8744	Charles Pope Glucose Co	....	Saco ....
8745	Charles Pope Glucose Co	....	Biddeford ....
8746	Charles Pope Glucose Co	....	Westbrook ....
8747	Charles Pope Glucose Co	....	Stroudwater ....
8748	Charles Pope Glucose Co	....	Portland ....
8749	National Starch Manf'g Co	Des Moines, Ia....	Portland ....
8750	National Starch Manf'g Co	Des Moines, Ia.....	Auburn.............
8751	National Starch Manf'g Co	Des Moines, Ia.....	South Paris ....
8752	National Starch Manf'g Co	Des Moines, Ia.....	Waterville ....
8753	National Starch Manf'g Co	Des Moines, Ia....	Dexter ....
8754	National Starch Manf'g Co	Des Moines, Ia.....	Foxcroft. ....
8755	National Starch Manf'g Co	Des Moines, Ia....	Bangor ....
8756	National Starch Manf'g Co	Indianapolis, Ind..	Milo ....
8757	National Starch Manf'g Co	Indianapolis, Ind..	Bowdoinham ......
8758	The Glucose Sugar Refining Co.	....	South Paris ....
8759	The Glucose Sugar Refining Co.	....	Bangor ....
8760	The Glucose Sugar Refining Co.	....	Bangor ....
8761	The Glucose Sugar Refining Co.	Rockford, Ill	Auburn ....
8843	Norton Chapman Co	....	Calais ....
8762	E. W. Blatchford & Co	Chicago, Ill	Brunswick ....
8763	E. W. Blatchford & Co	Chicago, Ill	Gardiner ....
8764	E. W. Blatchford & Co	Chicago, Ill	Freeport ....
8765	E. W. Blatchford & Co	Chicago, Ill	Westbrook ....
8766	The Cleveland Linseed Oil Co..	....	Augusta ....
8767	The Cleveland Linseed Oil Co..	....	Newport. ....
8768	The Cleveland Linseed Oil Co..	....	Pittsfield ....
8769	The Cleveland Linseed Oil Co..	....	Auburn ....
8770	The Cleveland Linseed Oil Co..	....	South Paris ....
8771	The Cleveland Linseed Oil Co..	....	Skowhegan ....
8772	S. A. & J. H. True Co	....	South Paris ....
8773	S. A. & J. H. True Co	....	Bath ....
8774	S. A. & J. H. True Co	....	Stroudwater ....

ANALYSES—Continued.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Chicago Gluten Meal	31.69	38.00	3.89	2.00	8728
Chicago Gluten Meal	34.94	38.00	2.91	2.00	8729
Chicago Gluten Meal	35.56	38.00	5.03	2.00	8730
Chicago Gluten Meal	33.19	38.00	5.71	2.00	8731
Chicago Gluten Meal	34.06	38.00	5.30	2.00	8732
Chicago Gluten Meal	32.44	38.00	4.16	2.00	8733
Chicago Gluten Meal	31.56	36.00	4.11	3.37	8734
Chicago Gluten Meal	33.44	36.00	4.74	3.37	8735
Chicago Gluten Meal	34.06	36.00	4.41	3.37	8736
Chicago Gluten Meal	31.56	36.00	3.79	3.37	8737
Cream Gluten Meal	32.81	34.12	2.79	3.20	8738
Cream Gluten Meal	34.81	34.12	2.93	3.20	8739
Cream Gluten Meal	31.44	34.12	2.68	3.20	8740
Cream Gluten Meal	31.44	34.12	2.81	3.20	8741
Cream Gluten Meal	33.31	34.12	2.45	3.20	8742
Cream Gluten Meal	34.06	34.12	1.64	3.20	8743
Cream Gluten Meal	30.31	34.12	2.44	3.20	8744
Cream Gluten Meal	32.56	34.12	2.57	3.20	8745
Cream Gluten Meal	32.69	34.12	2.77	3.20	8746
Cream Gluten Meal	34.56	34.12	2.91	3.20	8747
Cream Gluten Meal	34.94	34.12	2.91	3.20	8748
King Gluten Meal	31.44	32.00	15.88	16.00	8749
King Gluten Meal	31.56	32.00	16.26	16.00	8750
King Gluten Meal	31.44	32.00	14.86	16.00	8751
King Gluten Meal	31.06	32.00	16.28	16.00	8752
King Gluten Meal	31.31	32.00	16.18	16.00	8753
King Gluten Meal	32.19	32.00	14.25	16.00	8754
King Gluten Meal	30.94	32.00	16.05	16.00	8755
King Gluten Meal	35.44	32.00	7.21	16.00	8756
King Gluten Meal	34.81	32.00	4.81	16.00	8757
Buffalo Gluten Feed	25.94	25.50	4.67	4.00	8758
Buffalo Gluten Feed	25.56	25.50	4.53	4.00	8759
Buffalo Gluten Feed	26.81	25.50	3.80	4.00	8760
Rockford Diamond Gluten Feed	25.06	24.20	3.85	3.78	8761
Gluten Feed	22.31	24.20	4.04	3.76	8843
Blatchford's Calf Meal	25.31	No guar.	5.67	No guar.	8762
Blatchford's Calf Meal	25.44	No guar.	5.58	No guar.	8763
Blatchford's Calf Meal	24.06	No guar.	5.39	No guar.	8764
Blatchford's Calf Meal	24.44	No guar.	5.09	No guar.	8765
Cleveland Flax Meal	36.31	39.00	3.45	1.50	8766
Cleveland Flax Meal	34.69	39.00	2.90	1.50	8767
Cleveland Linseed Oil Meal	38.44	39.00	1.60	1.50	8768
Cleveland Linseed Oil Meal	35.81	39.00	3.14	1.50	8769
Cleveland Linseed Oil Meal	37.31	39.00	2.44	1.50	8770
Cleveland Linseed Oil Meal	38.81	39.00	2.12	1.50	8771
True's Linseed Oil Meal	29.81	36.94	8.57	6.58	8772
True's Linseed Oil Meal	29.06	36.94	8.40	6 58	8773
True's Linseed Oil Meal	33.44	36.94	9.45	6.58	8774

MANUFACTURERS—Continued.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8775	International Milling Co		Brunswick
8776	International Milling Co		Foxcroft
8777	S. A. & J. H. True Co		Portland
8778	O. Holway & Co.	Auburn	Auburn
8779	O. Holway & Co.	Auburn	Winthrop
8780	O. Holway & Co.	Auburn	Foxcroft
8781	The American Cereal Co	Chicago, Ill	Portland
8782	The American Cereal Co	Chicago, Ill	Portland
8783	The American Cereal Co	Chicago, Ill	Saco
8784	The American Cereal Co	Chicago, Ill	Augusta
8785	The American Cereal Co	Chicago, Ill	Brunswick
8786	The American Cereal Co	Chicago, Ill	Auburn
8787	The American Cereal Co	Chicago, Ill	Bethel
8788	The American Cereal Co	Chicago, Ill	Monmouth
8789	The American Cereal Co	Chicago, Ill	Belfast
8790	The American Cereal Co	Chicago, Ill	Bath
8844	The American Cereal Co	Chicago, Ill	Eastport
8791	The American Cereal Co	Chicago, Ill	Skowhegan
8792	The American Cereal Co	Chicago, Ill	Newport
8793	The American Cereal Co	Chicago, Ill	Bucksport
8794	The American Cereal Co	Chicago, Ill	South Brewer
8795	The American Cereal Co	Chicago, Ill	Bangor
8846	The American Cereal Co	Chicago, Ill	Calais
8796	The American Cereal Co	Chicago, Ill	Brunswick
8797	The American Cereal Co	Chicago, Ill	Auburn
8798	The American Cereal Co	Chicago, Ill	Camden
8799	The American Cereal Co	Chicago, Ill	Foxcroft
8800	The American Cereal Co	Chicago, Ill	Portland
8801	The American Cereal Co	Chicago, Ill	Stroudwater
8802	The American Cereal Co	Chicago, Ill	Saco
8803	The American Cereal Co	Chicago, Ill	Augusta
8804	The American Cereal Co	Chicago, Ill	Brunswick
8805	The American Cereal Co	Chicago, Ill	Bath
8845	The American Cereal Co	Chicago, Ill	Eastport
8806	The H-O Co	Buffalo, N. Y	Freeport
8807	The H-O Co	Buffalo, N. Y	Augusta
8808	The H-O Co	Buffalo, N. Y	Waterville
8809	The H-O Co	Buffalo, N. Y	Rockland
8810	The H-O Co	Buffalo, N. Y	Skowhegan
8811	The H-O Co	Buffalo, N. Y	Portland
8812	The H-O Co	Buffalo, N. Y	Freeport
8813	The H-O Co	Buffalo, N. Y	Auburn
8814	The H-O Co	Buffalo, N. Y	Waterville
8815	The H-O Co	Buffalo, N. Y	Skowhegan
8816	The H-O Co	Buffalo, N. Y	Freeport
8817	The H-O Co	Buffalo, N. Y	Freeport
8818	The American Cereal Co	Chicago, Ill	Portland
8819	The American Cereal Co	Chicago, Ill	Auburn

ANALYSES—Continued.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Sucrene Oil Meal	23.31	24.75	3.53	3.50	8775
Sucrene Oil Meal	26.94	24.75	3.65	3.50	8776
True's Corn and Oat Feed	9.31	9.63	3.45	4.23	8777
Monarch Corn and Oat Feed	10.94	10.25	8.29	7.47	8778
Monarch Corn and Oat Feed	9.81	10.25	7.16	7.47	8779
Monarch Corn and Oat Feed	9.94	10.25	7.56	7.47	8780
Victor Corn and Oat Feed	8.19	9.46	3.84	3.92	8781
Victor Corn and Oat Feed	7.31	9.46	3.55	3.92	8782
Victor Corn and Oat Feed	8.44	9.46	3.49	3.92	8783
Victor Corn and Oat Feed	7.31	9.46	3.23	3.92	8784
Victor Corn and Oat Feed	7.94	9.46	3.46	3.92	8785
Victor Corn and Oat Feed	7.94	9.46	3.68	3.92	8786
Victor Corn and Oat Feed	8.56	9.46	3.71	3.92	8787
Victor Corn and Oat Feed	8.06	9.46	3.31	3.92	8788
Victor Corn and Oat Feed	8.19	9.46	3.60	3.92	8789
Victor Corn and Oat Feed	7.56	9.46	3.18	3.92	8790
Victor Corn and Oat Feed	9.94	9.46	4.91	3.92	8844
Victor Corn and Oat Feed	9.69	9.46	5.12	3.92	8791
Victor Corn and Oat Feed	7.56	9.46	3.15	3.92	8792
Victor Corn and Oat Feed	7.81	9.46	3.21	3.92	8793
Victor Corn and Oat Feed	8.81	9.46	4.06	3.92	8794
Victor Corn and Oat Feed	8.69	9.46	4.14	3.92	8795
Corn, Oats and Barley	10.81	11.26	4.98	4.15	8846
Quaker Dairy Feed	10.31	12.03	3.19	3.49	8796
Quaker Dairy Feed	11.56	12.03	3.44	3.49	8797
Quaker Dairy Feed	13.69	12.03	4.13	3.49	8798
Quaker Dairy Feed	13.81	12.03	3.40	3.49	8799
Quaker Oat Feed	11.31	12.03	4.35	3.49	8800
Quaker Oat Feed	12.94	12.03	3.73	3.49	8801
Quaker Oat Feed	11.94	12.03	3.67	3.49	8802
Quaker Oat Feed	11.06	12.03	3.62	3.49	8803
Quaker Oat Feed	13.94	12.03	3.69	3.49	8804
Quaker Oat Feed	14.56	12.03	3.77	3.49	8805
Quaker Oat Feed	13.69	12.03	4.08	3.49	8845
The H-O Co.'s Dairy Feed	17.44	18.00	4.84	4.50	8806
The H-O Co.'s Dairy Feed	16.94	18.00	4.71	4.50	8807
The H-O Co.'s Dairy Feed	17.63	18.00	5.32	4.50	8808
The H-O Co.'s Dairy Feed	18.50	18.00	4.63	4.50	8809
The H-O Co.'s Dairy Feed	18.63	18.00	4.81	4.50	8810
The H-O Co.'s Dundee Corn & Oat Feed	8.13	8.38	3.42	2.95	8811
The H-O Co.'s Dundee Corn & Oat Feed	8.56	8.38	3.31	2.95	8812
The H-O Co.'s Dundee Corn & Oat Feed	8.19	8.38	3.24	2.95	8813
The H-O Co.'s Dundee Corn & Oat Feed	8.44	8.38	2.98	2.95	8814
The H-O Co.'s Dundee Corn & Oat Feed	8.00	8.38	3.59	2.95	8815
The H-O Co.'s Horse Feed	12.19	12.30	4.42	4.90	8816
The H-O Co.'s Poultry Feed	15.31	16.80	6.36	7.00	8817
American Cereal Co.'s Poultry Feed	8.31	No guar.	6.32	No guar.	8818
American Cereal Co.'s Poultry Feed	12.06	No guar.	6.06	No guar.	8819

MANUFACTURERS—Concluded.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8820	Unknown	....	Freeport
8821	B. Randall & Co	East Boston, Mass.	Bowdoinham
8822	Nash Manufacturing Co	South Brewer	Winterport
8823	Nash Manufacturing Co	South Brewer	Bangor
8824	The Bowker Co	Boston, Mass.	Portland
8825	The Bowker Co	Boston, Mass.	Freeport
8826	The Bowker Co	Boston, Mass.	Gardiner
8827	The Bowker Co	Boston, Mass.	Belfast
8828	The Bowker Co	Boston, Mass.	Portland
8829	Bradley Fertilizer Co	Boston, Mass.	Portland
8830	Bradley Fertilizer Co	Boston, Mass.	Bangor
8831	Nash Manufacturing Co	South Brewer	South Brewer

ANALYSES—Concluded.

Name of Feed.	PROTEIN.		FAT.		Station number.
	Found—per cent.	Guaranteed—per cent.	Found—per cent.	Guaranteed—per cent.	
Rice Feed	10.69	No guar.	11.31	No guar.	8820
American Poultry Meal	35.00	No guar.	23.88	No guar.	8821
Nash Manufacturing Co.'s Beef Scraps	46.94	52.19	26.41	28.42	8822
Nash Manufacturing Co.'s Beef Scraps	42.94	52.19	27.29	28.42	8823
Bowker's Animal Meal	43.56	30.00	10.15	5.00	8824
Bowker's Animal Meal	45.56	30.00	11.06	5.00	8825
Bowker's Animal Meal	46.06	30.00	9.37	5.00	8826
Bowker's Animal Meal	42.81	30.00	10.51	5.00	8827
Bowker's Pure Beef Scraps	48.50	No guar.	17.14	No guar.	8828
Bradley's Superior Meat Meal	45.69	40.00	10.93	10.00	8829
Bradley's Superior Meat Meal	47.94	40.00	9.47	10.00	8830
Cattle or Poultry Bone	16.06	11.00	5.87	......	8831

SUMMARY OF ANALYSES.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
J. E. Soper & Co.'s Cotton Seed Meal.	2	Highest Lowest Average	46.50 44.40 45.45	.... 43.00	13.07 12.12 12.60	9.00
Chapin & Co.'s Cotton Seed Meal.	6	Highest Lowest Average	45.81 43.69 44.70	.... 43.00	13.86 9.46 11.62	9.00
Humphreys, Goodwin & Co.'s Cotton Seed Meal.	1	....	45.06	43.00	9.27	9.00
Humphreys, Goodwin & Co.'s Dixie Brand Cotton Seed Meal.	1	....	44.94	43.00	8.29	9.00
E. B. Williams & Co.'s Cotton Seed Meal.	1	....	43.00	42.00	10.63	8.00
E. B. Williams & Co.'s "Daisy Brand" Cotton Seed Meal.	6	Highest Lowest Average	45.88 43.00 44.69	.... 43.00	12.10 8.96 10.96	9.00
F. W. Brodé & Co.'s Owl Brand Cotton Seed Meal.	6	Highest Lowest Average	45.06 37.31 43.06	... . 43.00	18.85 11.67 13.34	9.00
The American Cotton Oil Co.'s Prime Cotton Seed Meal.	3	Highest Lowest Average	43.19 41.69 42.40	.... 43.00	10.96 10.19 10.50	9.00
The Southern Cotton Oil Co.'s Prime, Finely Ground Cotton Seed Meal.	1	....	45.56	43.00	11.17	9.00
Arlington Oil & Fertilizer Co.'s Cotton Seed Meal.	2	Highest Lowest Average	44.94 44.63 44.79	.... 43.00	10 88 8.69 9.79	9.00
Doten Grain Co.'s Cotton Seed Meal.	1	....	43.69	....	12.04	
Paris Flouring Co.'s Prime Memphis Cotton Seed Meal.	1	....	42.69	43.00	13.66	9.00
Manufacturers Unknown. Cotton Seed Meal.	2	Highest Lowest Average	43.31 39.06 41.19	.... 42.00	14.06 11.80 12.93	8.00
Manufacturers Unknown. Unguaranteed Cotton Seed Meal.	5	Highest Lowest Average	45.81 43.44 44.36	....	14.10 11.68 12.84	
Average of Cotton Seed Meals.	38	Average	43.98	....	11.79	
Sea Island Cotton Seed Meal...	1	....	25.69	....	6.56	
The Glucose Sugar Refin'g Co.'s Chicago Gluten Meal.	19	Highest Lowest Average	36.31 31.56 33.80	38.00	5.71 2.91 4.24	2.00
Charles Pope Glucose Co.'s Cream Gluten Meal.	11	Highest Lowest Average	34.94 30.31 32.99	.... 34.12	2.93 1.64 2.63	3.20

SUMMARY OF ANALYSES—Continued.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
National Starch Manf'g Co.'s King Gluten Meal from Des Moines Mill.	7	Highest Lowest Average	32.19 30.94 31.42	.... 32.00	16.28 14.25 15.68	16.00
The National Starch Man. Co.'s King Gluten Meal from Indianapolis Mill.	2	Highest Lowest Average	35.44 34.81 35.13	.... 32.00	7.21 4.81 6.01	16.00
The Glucose Sugar Refin'g Co.'s Buffalo Gluten Feed.	3	Highest Lowest Average	26.81 25.56 26.10	.... 25.50	4.67 3.80 4.33	4.00
The Glucose Sugar Refin'g Co.'s Rockford Diamond Gluten Feed.	1	....	25.06	24.20	3.85	3.78
Norton Chapman Co.'s Gluten Feed.	1	....	22.31	24.20	4.04	3.76
E. W. Blatchford & Co.'s Blatchford's Calf Meal.	4	Highest Lowest Average	25.44 24.06 24.81	....	5.67 5.09 5.43	
The Cleveland Linseed Oil Co.'s Cleveland Flax Meal.	2	Highest Lowest Average	36.31 34.69 35.50	.... 39.00	3.45 2.90 3.17	1 50
The Cleveland Linseed Oil Co.'s Linseed Oil Meal.	4	Highest Lowest Average	38.81 35.81 37.59	.... 39.00	3.14 1.60 2.32	1.50
S. A. & J. H. True Co.'s Linseed Oil Meal.	3	Highest Lowest Average	33.44 29.06 30.77	.... 36.94	9.45 8.40 8.81	6.58
International Milling Co.'s Sucrene Oil Meal.	2	Highest Lowest Average	26.94 23.31 25.12	.... 24.75	3.65 3.53 3.59	3.50
S. A. & J. H. True Co.'s Corn and Oat Feed.	1	....	9.31	9.63	3.45	4.23
O. Holway & Co.'s Monarch Corn and Oat Feed.	3	Highest Lowest Average	10.94 9.81 10.23	.... 10.25	8.29 7.16 7.67	7.47
The American Cereal Co.'s Victor Corn and Oat Feed.	16	Highest Lowest Average	9.94 7.31 8.25	.... 9.46	5.12 3.15 3.73	3.92
The American Cereal Co.'s Corn, Oats and Barley.	1	....	10.81	11.26	4.98	4.15
The American Cereal Co.'s Quaker Dairy Feed.	4	Highest Lowest Average	13.81 10.31 12.34	.... 12.03	4.13 3.19 3.54	3.49
The American Cereal Co.'s Quaker Oat Feed.	7	Highest Lowest Average	14.56 11.06 12.78	.... 12.03	4.35 3.62 3.84	3.49
The H-O Co.'s Dairy Feed.	5	Highest Lowest Average	18.63 16.94 17.83	.... 18.00	5.32 4.63 4.86	4.50

SUMMARY OF ANALYSES—Concluded.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
The H-O Co.'s Dundee Corn and Oat Feed.	5	Highest Lowest Average	8.56 8.00 8.26	.... 8.38	3.59 2.98 3.31	2.95
The H-O Co.'s Horse Feed.	1	....	12.19	12.30	4.42	4.90
The H-O Co.'s Poultry Feed.	1	....	15.31	16.80	6.36	7.00
American Cereal Co.'s Poultry Feed.	2	Highest Lowest Average	12.06 8.31 10.18	....	6.32 6.06 6.19	
Rice Feed.	1	....	10.69	No guar.	11.31	
B. Randall & Co.'s American Poultry Meal.	1	....	35.00	....	23.88	
Nash Manufacturing Co.'s Beef Scraps.	2	Highest Lowest Average	46.94 42.94 44.94	.... 52.19	27.29 26.41 26.85	28.42
The Bowker Co.'s Bowker's Animal Meal.	4	Highest Lowest Average	46.06 42.81 44.51	.... 30.00	11.06 9.37 10.27	5 00
The Bowker Co.'s Bowker's Pure Beef Scraps.	1	....	48.50	....	17.14	
Bradley Fertilizer Co.'s Bradley's Superior Meat Meal	2	Highest Lowest Average	47.94 45.69 46.82	.... 40.00	10.93 9.47 10.20	10.00
Nash Manufacturing Co.'s Cattle or Poultry Bone.	1	....	16.06	11.00	5.87	

Violations of the Law.

Because of the newness of the law and that its requirements would be unwittingly violated, after consulting with the Secretary of the Board of Agriculture it was deemed best that for a year or two the Director directly notify dilinquents and only report to the Secretary cases of willful and persistent failure to comply with the law. Last October the law had been in operation two years, long enough time for dealers to become familiar with its requirements and it seemed time to see that the law is literally complied with in every instance. Accordingly each violation of the law reported by inspectors and each substantiated complaint from consumers has been, since December, 1899, reported by the Director to the Secretary of Agriculture who has given the formal notice to the delinquents required by law. Subsequent violations by dealers who have been thus notified will make them liable to prosecution without further notice.

The total number of violations thus reported are 38, of which 22 are for offering goods without having the tax tag affixed. In nearly all of these cases the dealers had the tags in the office and claimed that they attached them at the time of sale. In 16 instances the goods did not carry the guarantee. The goods thus unbranded consisted of 4 lots of Blatchford's calf meal (of which there is little sold) 1 lot of beef scrap for poultry, 1 lot of poultry meal, 1 car of rice feed, 2 small lots of American Cereal Company's poultry feed, 1 car Victor corn and oat feed, and 7 lots of cottonseed meal. One of the cottonseed meals was old low grade goods which were in stock (and which the dealer had analyzed by the Station in 1897) when the law went into effect; the other cottonseed meals were high grade goods from houses that have usually fully complied with the requirements of the law. The dealer did not know that the rice feed was subject to the law. It was the first he had handled (and the first reported to the Station). Before selling, the law was complied with. The American Cereal Company did not know that the law applied to poultry foods and will in the future see that these goods are tagged before they leave the mill. As Victor corn and oat feed is all tagged at the mill, it would seem that a car not intended for this State was shipped here. Two cars of feeds with Vermont tags were shipped into the State; the jobber provided Maine tags for them, however.

Guarantees and Results of Analyses.

As in the past cottonseed meal, both in number of brands and in carloads sold, probably leads the concentrated feeds coming under the law. Only one lot of Sea Island cottonseed meal was found by the inspector and that was in the State in 1897 when the law went into effect.

One lot of Owl Brand cottonseed meal carried only 37.31 per cent of protein. Five other samples carried from 43.19 per cent to 45.06 per ent. As the sample low in protein carried 18.85 per cent of fat instead of 12 per cent as the others did, the low protein is probably explained by the fact that the oil was not as completely expressed as usual. On this account the case was not reported to the Secretary of Agriculture.

In 1897-8 the American Cotton Oil Company's cottonseed meal was one of the best in the State, averaging about 46 per cent of protein. The quality of this output has steadily decreased, and only one of the three lots sampled were up to guarantee: the others carried 41.69 and 42.31 per cent with a guarantee of 43 per cent protein. All of the other samples of cottonseed agreed fairly well with the guarantees.

The sample of the Sea Island cottonseed meal was from a lot 3 years or more old. While in 1896 and 1897 considerable of these low grade cottonseed meals were sold in the State, so far as we can learn, (and we investigate every suspicious case reported to us) there is very little now sold.

Chicago gluten meal changes in composition very greatly from time to time as the following comparisons show:

	Number of samples.	Protein.			Fat.		
		Highest.	Lowest.	Average.	Highest.	Lowest.	Average.
	%	%	%	%	%	%	%
Winter 1898	15	38.38	34.00	35.64	4.15	2.48	3.37
Fall 1898	14	40.63	36.13	38.01	2.79	1.70	2.15
Winter 1899	14	38.94	34.50	37.42	3.61	2.27	3.01
Fall 1899	19	36.31	31.56	33.83	5.30	2.91	4.27

These goods are guaranteed 38 per cent protein and 2 per cent fat. The Norton-Chapman Company of Portland are the State agents and all of the goods sold in the State are guaranteed by them. These goods contain substantially less protein than guaranteed and the dealers have been reported to the Secretary of Agriculture.*

Five of the 11 samples of the Cream gluten meal fall below the guarantee in protein and the other 6 are but little above.

* Five samples of Chicago gluten sent to the Station in January by the State agents were above guarantee.

The guarantee is 34.12 per cent protein and 3.20 per cent fat, and the average of the 11 analyses is 32.99 per cent protein and 2.63 per cent fat.

King gluten meal from the Des Moines mill agrees fairly well in composition with its guarantee, being on the average .6 per cent below in protein and .3 per cent in fat. The King gluten from the Indianapolis mill is richer in protein and lower in fat and more nearly resembles Chicago gluten meal in composition. It is much below the guarantee in fat, but is three per cent above the guarantee in protein.

Buffalo gluten feed agrees quite closely with the guarantee of 25.50 per cent protein and 4 per cent fat.

Blatchford's Calf meal was not guaranteed. The dealers were reported to the Secretary of Agriculture.

Cleveland Flax meal is much below the guarantee in protein. The two lots examined have been reported to the Secretary of Agriculture. The average of four samples of Cleveland linseed oil meal shows it to be 1 per cent below guarantee in protein.

S. A. & J. H. True Company's linseed oil meal averages 7 per cent below the guarantee in protein; the cases have been reported to the Secretary of Agriculture.

The International Milling Company's Sucrene Oil meal agrees fairly well with the guarantee. The same is true of S. A. & J. H. True Company's corn and oat feed and monarch oat feed. Victor corn and oat feed runs lower in protein than in the past. It is guaranteed to carry 9.46 per cent protein. While two samples carried more protein than this, two samples had only 7.31 per cent and 16 samples averaged 8.25 per cent of protein.

Dairy feed, Quaker oat feed, the H-O Company's feed, the H-O Company's Dundee corn and oat feed, the H-O Company's horse feed, and the H-O Company's poultry feed all practically agreed with the guarantee.

The guarantee of Nash Manufacturing Company's beef scrap was based upon an analysis made by the Station of a sample which they sent for that purpose. Evidently the sample did not represent the output. The company and the dealers have been reported to the Secretary of Agriculture. The other poultry meals analyze above their guarantee. The Bowker Company have furnished a guarantee for their beef scraps.

FERTILIZER INSPECTION.

CHAS D. WOODS, Director.
J. M. BARTLETT, Chemist in Charge of Fertilizer Analysis

The law regulating the sale of commercial fertilizers in this State calls for two bulletins each year. The first of these contains the analyses of the samples received from the manufacturer, guaranteed to represent, within reasonable limits, the goods to be placed upon the market later. The second bulletin contains the analyses of the samples collected in the open market by a representative of the Station.

The figures which are given as the percentages of valuable ingredients guaranteed by the manufacturers are the minimum percentages of the guarantee. If, for instance, the guarantee is 2 to 3 per cent of nitrogen, it is evident that the dealer cannot be held to have agreed to furnish more than 2 per cent and so this percentage is taken as actual guarantee. The figures under the head of "found" are those showing the actual composition of the samples.

In 1894 this Station stopped printing trade valuations. The chief reason for so doing was that *commercial* values are not the same as *agricultural* values. Trade values are determined by market conditions, the agricultural value is measured by the increase of crop. Printing trade valuations increases the tendency, already far too strong, to purchase fertilizers on the *ton* basis without regard to the content or form of plant food. The agricultural value of a fertilizer depends upon the amount and form of nitrogen, phosphoric acid and potash it contains and the use to which it is to be put. The purchase of a fertilizer is really the purchase of one or more of these ingredients, and the thing of first importance is not the trade value of a ton, but the kinds and pounds of plant food contained in a ton.

DESCRIPTIVE LIST OF MANUFACTURERS' SAMPLES, 1900.

Station number.	Manufacturer, place of business and brand.
	HIRAM BLANCHARD, EASTPORT, ME.
2319	Blanchard's Fish, Bone and Potash
2320	Blanchard's Grass and Grain Fertilizer
2115	Blanchard's Ground Fish Scrap No. 2
	THE BOWKER FERTILIZER CO., BOSTON, MASS.
1852	Bowker's Corn Phosphate
2370	Bowker's Early Potato Manure
1251	Bowker's Farm and Garden Phosphate
2371	Bowker's Fresh Ground Bone Phosphate
1248	Bowker's Hill and Drill Phosphate
2372	Bowker's Potash Bone
1249	Bowker's Potato and Vegetable Fertilizer
1389	Bowker's Potato and Vegetable Phosphate
1390	Bowker's Six Per Cent Potato Fertilizer
1250	Bowker's Square Brand Bone and Potash
1866	Bowker's Staple Phosphate or Three Per Cent Fertilizer
2374	Bowker's Sure Crop Phosphate
1588	Bowker's Ten Per Cent Manure
1871	Gloucester Fish and Potash
1580	Stockbridge Corn and Grain Manure
1870	Stockbridge Pea and Bean Manure
1388	Stockbridge Potato and Vegetable Manure
2373	Stockbridge Seeding Down Manure
	BRADLEY FERTILIZER CO., BOSTON, MASS.
2112	Bradley's Complete Manure for Potatoes and Vegetables
2321	Bradley's Corn Phosphate
2111	Bradley's Eureka Fertilizer
2322	Bradley's Niagara Phosphate
2323	Bradley's Potato Fertilizer
2324	Bradley's Potato Manure
2325	Bradley's X. L. Superphosphate
	CLEVELAND DRYER CO., BOSTON, MASS.
1607	Cleveland Fertilizer for All Crops
2329	Cleveland Potato Phosphate
2109	Cleveland Seeding Down Fertilizer
2330	Cleveland Superphosphate
	E. FRANK COE CO., NEW YORK, N. Y.
2117	E. Frank Coe's Columbia Corn Fertilizer
2118	E. Frank Coe's Columbian Potato Fertilizer
2119	E. Frank Coe's Excelsior Potato Fertilizer
1617	E. Frank Coe's Grass and Grain Special
2116	E. Frank Coe's High Grade Ammoniated Bone Superphosphate
1884	E. Frank Coe's High Grade Potato Fertilizer
2388	E. Frank Coe's New Englander Corn Fertilizer
2141	E. Frank Coe's New Englander Potato Fertilizer
2120	E. Frank Coe's Prize Brand Grain and Grass Fertilizer
2389	E. Frank Coe's Red Brand Excelsior Guano
1405	E. Frank Coe's Special Potato Fertilizer
2121	E. Frank Coe's Standard Grade Ammoniated Bone Superphosphate

Analyses of Manufacturers' Samples, 1900.

Station number.	Nitrogen. Soluble in water.	Nitrogen. Insoluble in water.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Soluble.	Phosphoric Acid. Reverted.	Phosphoric Acid. Insoluble.	Phosphoric Acid. Available. Found.	Phosphoric Acid. Available. Guaranteed.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Potash. Found.	Potash. Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
2319	1.08	2.28	3.36	3.00	.16	2.68	.98	2.84	3.00	3.82	4.00	3.45	3.00
2320	.62	2.64	3.26	4.47	.16	2.98	.41	3.14	3.00	3.55	4.28	2.08	2.00
2115	.49	3.64	4.13	4.00	....	3.39	.89	3.39	3.00	4.43	4.00	1.44	1.00
1852	....	......	1.88	1.60	......	......	2.77	8.59	7.00	11.36	9.00	2.26	2.00
2370	1.46	1.54	3.00	3.00	4.21	3.52	2.23	7.73	7.00	9.96	9.00	7.06	7.00
1251	.....	......	1.86	1.50	5.27	3.01	1.79	8.28	8.00	10.07	10.00	2.21	2.00
2371	.77	1.80	2.57	2.25	......	.....	......	......	.....	25.39	24.00	......	......
1248	....	......	2.60	2.25	7.36	1.87	3.08	9.23	9.00	12.31	12.00	2.52	2.00
2372	.53	.36	.89	.75	2.54	4.80	1.91	7.34	6.00	9.25	8.00	2.70	2.00
1249	......	.....	2.54	2.25	3.79	2.54	4.31	6.33	8.00	10.64	10.00	4.42	4.00
1389	.....	......	1.77	1.50	3.83	3.50	5.40	7.33	8.00	12.73	10.00	2.34	2.00
1390	....	.....	1.01	.75	3.93	3.92	3.86	7.81	7.00	11.67	10.00	6.38	6.00
1250	......	......	1.79	1.50	......	6.40	7.19	6.40	6.00	13.59	12.00	2.21	2.00
1866	......	......	1.00	.75	......	......	3.18	8.68	8.00	11.86	10.00	3.65	3.00
2374	.29	.50	.79	.75	6.36	3.70	2.23	10.06	9.00	12.29	11.00	2.30	2.00
1588	......	....	1.15	.75	1.30	5.17	3.61	6.47	6.00	10.08	8.00	10.98	10.00
1871	......	......	.97	.75	....	......	4.86	6.58	6.00	11.44	9.00	1.76	1.00
1580	......	.....	3.33	3.00	6.78	1.85	1.91	8.63	8.00	10.54	10.00	6.55	6.00
1870	.....	......	2.51	2.00	......	.....	3.21	6.89	6.00	10.10	8.00	6.28	6.00
1388	......	.....	3.43	3.25	3.12	2.11	4.26	5.25	6.00	9.49	7.00	9.76	10.00
2373	.92	1.26	2.18	2.50	5.22	3.33	1.94	8.55	6.00	10.49	10.00	10.50	10.00
2112	1.06	2.40	3.46	4.00	5.36	3.32	1.51	8.68	8.00	10.19	9.00	6.91	7.00
2321	.66	1.42	2.08	2.50	7.05	2.55	2.56	9.60	8.00	12.16	10.00	2.01	1.50
2111	.11	1.06	1.17	1.25	5.93	2.35	1.55	8.28	8.00	9.83	9.00	2.32	2.00
2322	.40	.64	1.04	1.00	5.41	3.15	1.38	8.56	7.00	9.94	8.00	1.49	1.08
2323	.77	1.22	1.99	2.50	5.74	4.74	2.54	10.48	8.00	13.02	10.00	3.17	3.00
2324	.81	1.58	2.39	3.00	2.89	3.80	3.18	6.69	6.00	9.87	8.00	5.15	5.00
2325	1.10	1.36	2.46	3.00	6.74	3.16	1.80	9.90	9.00	11.70	11.00	2.68	2.00
1607	......	......	1.48	1.03	6.71	2.16	2.35	8.87	8.00	11.22	9.00	2.42	2.00
2329	.62	1.34	1.96	2.05	5.95	3.99	2.74	9.94	8.00	12.68	10.00	3.03	3.00
2109	.11	1.06	1.17	1.03	5.79	2.89	1.27	8.68	8.00	9.95	9.00	2.20	2.00
2330	.66	1.40	2.06	2.03	7.17	2.35	2.62	9.52	8.00	12.14	9.00	2.03	1.50
2117	.28	1.22	1.50	1.23	5.97	2.86	2.67	8.83	8.50	11.50	10.50	2.94	2.50
2118	.25	1.19	1.44	1.20	5.85	2.97	2.60	8.82	8.50	11.45	10.00	2.75	2.50
2119	.65	2.02	2.67	2.50	6.14	1.34	1.27	7.48	7.00	8.75	9.00	9.91	8.00
1617	......	.....	2.83	.80	7.88	2.96	3.63	10.84	8.50	14.47	10.00	1.21	1.50
2116	......	......	1.68	1.85	5.97	2.62	2.50	8.59	9.00	11.42	11.00	2.90	2.50
1884	......	....	2.50	2.40	.....	....	1.29	7.71	7.00	9.00	8.00	7.86	6.50
2388	1.76	1.82	3.60	.80	5.88	1.86	1.44	7.71	7.50	9.11	.....	8.99	3.00
2141	.20	.95	1.15	.80	7.77	2.98	1.96	10.75	7.50	12.71	9.00	3.46	3.00
2120	......	......	......	.....	12.30	2.57	.47	14.87	10.50	15.34	12.00	.67	2.00
2389	.88	.40	1.28	3.40	6.94	2.33	2.40	9.27	9.00	11.76	......	3.81	6.00
1405	.....	.....	1.95	1.65	7.43	1.82	4.20	9.25	8.00	13.45	10.00	4.58	4.00
2121	.27	1.26	1.53	1.20	6.32	2.33	2.87	8.65	8.00	11.52	10.00	2.45	2.25

Descriptive List of Manufacturers' Samples, 1900.

Station number.	Manufacturer, place of business and brand.
	CROCKER FERTILIZER AND CHEMICAL CO., BUFFALO, N. Y.
2331	Crocker's Ammoniated Corn Phosphate
2332	Crocker's Grass and Oats Fertilizer
2333	Crocker's New Rival Ammoniated Superphosphate
2334	Crocker's Potato, Hop and Tobacco Phosphate
2335	Crocker's Superior Fertilizer
	CUMBERLAND BONE PHOSPHATE CO., PORTLAND, ME.
2336	Cumberland Potato Fertilizer
1395	Cumberland Seeding Down Manure
2337	Cumberland Superphosphate
	CLARK'S COVE FERTILIZER CO., BOSTON, MASS.
2326	Bay State Fertilizer
2327	Bay State Fertilizer, G. G
1219	Bay State Fertilizer for Seeding Down
2328	King Philip Alkaline Guano
	L. B. DARLING FERTILIZER CO., PAWTUCKET, R. I.
2376	Darling's Animal Fertilizer, G. Brand
2377	Darling's Blood, Bone and Potash
	GREAT EASTERN FERTILIZER CO., RUTLAND, VT.
1578	Great Eastern Dissolved Bone
1230	Great Eastern General Fertilizer
1231	Great Eastern Grass and Oats Fertilizer
2384	*Great Eastern Northern Corn Special
2383	*Great Eastern Potato Manure
	LOWELL FERTILIZER CO., BOSTON, MASS.
1874	Swift's Lowell Animal Fertilizer
1875	Swift's Lowell Bone Fertilizer
1876	Swift's Lowell Dissolved Bone and Potash
1879	Swift's Lowell Fruit and Vine Fertilizer
2386	Swift's Lowell Ground Bone
2387	Swift's Lowell Potato Manure
1877	Swift's Lowell Potato Phosphate
	LISTER'S AGRICULTURAL CHEMICAL WORKS, NEWARK, N. J.
2105	Lister's Seeding Down Fertilizer
2104	Lister's Special Potato Fertilizer
2103	Lister's Success Fertilizer
2102	Lister's U. S. Superphosphate
	NATIONAL FERTILIZER CO., BRIDGEPORT, CONN.
1885	Chittenden's Ammoniated Bone
1886	Chittenden's Complete Fertilizer
2385	Chittenden's Market Garden
	NEW ENGLAND FERTILIZER CO., BOSTON, MASS.
2378	New England Corn Phosphate
2379	New England Potato Fertilizer
	SAMUEL G. OTIS, HALLOWELL, ME.
2369	Otis Potato Fertilizer
2380	Otis Seeding Down Fertilizer
2368	Otis Superphosphate
	PACIFIC GUANO CO., BOSTON, MASS.
2338	Pacific Guano Company's Grass and Grain Fertilizer
2339	Pacific Guano Company's Nobsque Guano
2340	Pacific Guano Company's Potato Special
2341	Pacific Guano Company's Soluble Pacific Guano
	PACKER'S UNION FERTILIZER CO., NEW YORK, N. Y.
2342	Packer's Union Animal Corn Fertilizer
2343	Packer's Union Economical Vegetable Guano
2344	Packer's Union High Grade Potato Manure
2345	Packer's Union Universal Fertilizer
1619	Packer's Union Wheat, Oats and Clover Fertilizer

*Not yet analyzed.

Analyses of Manufacturers' Samples, 1900.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total. Found.	Total. Guaranteed.	Soluble.	Reverted.	Insoluble.	Available. Found.	Available. Guaranteed.	Total. Found.	Total. Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
2331	.26	2.06	2.32	2.05	4.52	3.65	3.87	8.17	8.00	12.04	9.00	2.26	1.50
2332	......	.18	.18	......	7.54	4.28	1.79	11.82	11.00	13.61	12.00	2.03	2.00
2333	.23	1.14	1.37	1.03	4.82	3.70	2.47	8.52	8.00	10.99	9.00	2.12	2.00
2334	.28	1.98	2.26	2.05	4.31	3.68	3.74	7.99	8.00	11.73	9.00	3.65	3.25
2335	.10	.96	1.06	.82	5.19	3.87	2.11	9.06	8.00	11.17	9.00	2.12	2.00
2336	.72	1.34	2.06	2.06	6.13	4.17	2.33	10.30	8.00	12.63	9.00	3.38	3.00
1395	......	.....	1.10	1.03	5.82	1.98	2.11	7.80	8.00	9.91	10.00	2.93	2.00
2337	.56	1.38	1.94	2.06	7.01	2.38	2.55	9.39	8.00	11.94	9.00	2.35	1 5
2326	1.14	1.32	2.46	2.47	7.26	3.08	1.80	10.34	9.00	12.14	10.00	2.35	2.00
2327	.62	1.40	2.02	2.06	7.21	2.42	2.36	9.63	8.00	11.99	9.00	1.95	1.50
1219	......	.....	2.33	1.03	7.18	2.55	1.89	9.73	8.00	11.62	10.00	2.59	2.00
2328	.43	.68	1.11	1.03	5.71	2.67	1.47	8.38	8.00	9.85	9.00	2.12	2.00
2376	.77	1.32	2.09	2.06	5.49	4.68	2.41	10.17	8.00	12.58	9.00	3.22	3.00
2377	......	4.21	4.21	4.12	6.47	1.27	.26	7.74	7.00	8.00	8.00	9.01	7.00
1578	......	......	......	.....	9.27	5.86	1.36	15.13	14.00	16.49	14.00	.....	......
1230	.....	......	1.10	.82	.69	9.25	2.26	9.94	8.00	12.20	8.00	4.72	4.00
1231	.....	......	......	......	4.11	6.88	4.08	10.99	11.00	15.07	11.00	2.15	2.00
2384	.42	1.84	2.26	2.06	5.02	4.60	2.35	9.62	8.00	11.97	8.00	2.26	1.50
2383	.96	1.20	2.16	2.06	4.67	3.92	2.64	8.59	8.00	11.23	8.00	5.33	3.25
1874	......	......	2.85	2.46	......	.....	1.01	10.38	9.00	11.39	10.00	4.10	4.00
1875	......	......	2.06	1.64	......	......	1.31	8.27	8.00	9.58	9.00	3.56	3.00
1876	......	......	1.90	1.64	.....	......	1.73	9.33	9.00	11.06	10.00	2.45	2.00
1879	.....	.....	3.69	3.29	......	......	.96	7.72	7.00	8.68	8.00	6.44	6.00
2386	......	......	2.38	2.46	......	......	......	....	5.00	27.24	22.90	......	......
2387	.78	.94	1.72	1.64	3.33	4.47	1.35	7.80	7.00	9.15	8.00	4.52	4.00
1877	......	......	2.61	2.46	......	......	1.08	9.41	8.00	10.49	9.00	6.96	6.00
2105	......	......	.90	.62	7.58	2.64	2.47	10.22	10.00	12.69	11.00	1.06	1.00
2104	.25	1.46	1.71	1.65	5.87	2.52	2.38	8.39	8.00	10.77	9.00	2.94	3.00
2103	.27	1.22	1.49	1.24	7.23	2.33	2.43	9.56	9.50	11.99	11.50	2.06	2.00
2102	.19	1.35	1.54	1.32	5.09	2.34	2.03	7.43	7.00	9.46	8.00	2.39	2.00
1885	.. ..	......	2.42	1.60	......	......	1.61	9.72	9.00	11.33	10.00	3.69	2.00
1886	......	....	3.79	3.30	......	......	1.33	9.35	8.00	10.68	10.00	6.31	6.00
2385	1.22	1.00	2.22	2.47	4.45	2.60	2.48	7.05	6.00	9.53	8.00	5.94	5.00
2378	.76	1.02	1.78	1.64	3.85	4.93	1.33	8.78	8.00	10.11	9.00	3.23	3.00
2379	.88	.88	1.76	1.64	3.46	4.89	.98	8.35	7.00	9.33	8.00	4.28	4.00
2369	.77	1.22	1.99	2.06	5.68	5.03	2.42	10.71	8.00	13.13	10.00	3.20	3.00
2380	.49	.62	1.11	1.25	5.46	2.89	1.35	8.35	8.00	9.70	10.00	1.56	2.00
2368	.68	1.38	2.06	2.06	6.94	2.92	2.43	9.86	8.00	12.29	10.00	2.16	1.50
2338	.42	.64	1.06	.82	5.46	3.01	1.43	8.47	7.00	9.90	8.00	2.99	1.00
2339	.40	.66	1.06	1.03	5.52	2.66	1.63	8.18	8.00	9.81	9.00	1.97	2.00
2340	.76	1.34	2.10	2.05	5.69	4.27	2.70	9.96	8.00	12.66	9.00	3.15	3.00
2341	.52	1.46	1.98	2.06	6.72	2.72	2.32	9.44	8.00	11.76	9.00	1.91	1.50
2342	.31	2.10	2.41	2.47	5.64	3.22	3.46	8.86	9.00	12.32	10.00	1.91	2.00
2343	.26	1.42	1.68	1.25	4.65	2.55	2.15	7.20	6.00	9.35	7.00	3.59	3.00
2344	.96	1.10	2.06	2.06	4.85	3.16	1.85	8.01	8.00	9.86	9.00	2.26	6.00
2345	.25	.96	1.21	.8235	6.05	3.22	1.46	9.27	8.00	10.73	9.00	5.04	4.00
1619	.....	......	.25	......	.....	... ..	1.20	10.92	11.00	12.12	12.00	2.39	2.00

Descriptive List of Manufacturers' Samples, 1900.

Station number.	Manufacturer, place of business and brand.
	PARMENTER & POLSEY FERTILIZER CO., PEABODY, MASS.
2124	Parmenter & Polsey Fertilizer Co.'s Special Potato Fertilizer
2123	Plymouth Rock Brand
2346	"P. and P." Potato Fertilizer
2125	Star Brand Superphosphate
	EDWIN J. PHILBRICK, AUGUSTA, ME.
1888	Philbrick's Fertilizer
	PORTLAND RENDERING CO., PORTLAND, ME.
1616	Portland Rendering Co.'s Bone Tankage
	THE QUINNIPIAC CO., BOSTON, MASS.
2347	Quinnipiac Corn Manure
2348	Quinnipiac Phosphate
2349	Quinnipiac Potato Manure
2350	Quinnipiac Potato Phosphate
2351	Quinnipiac Seeding Down Manure
	READ FERTILIZER CO., NEW YORK, N. Y.
2352	Read's Potato Manure
1396	Read's Practical Potato Special
1397	Read's Standard Fertilizer
2354	Read's Sure Catch Fertilizer
2355	Read's Vegetable and Vine Fertilizer
2353	Sampson Fertilizer
	THE RUSSIA CEMENT CO., GLOUCESTER, MASS.
1410	Essex Complete Manure for Corn, Grain and Grass
1411	Essex Complete Manure for Potatoes, Roots and Vegetables
2106	Essex Corn Fertilizer
2108	Essex Potato Fertilizer
1568	Essex XXX Fish and Potash
1891	Maine State Grange Chemicals
1892	Maine State Grange Potato Manure
2107	Maine State Grange Seeding Down Fertilizer
	SAGADAHOC FERTILIZER CO., BOWDOINHAM, ME.
2356	Dirigo Fertilizer
2357	Merrymeeting Superphosphate
2358	Sagadahoc Special Potato Fertilizer
2359	Sagadahoc Superphosphate
2360	Yankee Fertilizer
	STANDARD FERTILIZER CO., BOSTON, MASS.
1414	Standard "A" Brand
2361	Standard Fertilizer
2362	Standard Guano
2363	Standard Special for Potatoes
	JOHN WATSON, HOULTON, ME.
2375	Watson's Improved High Grade Potato Manure
	WILLIAMS & CLARK FERTILIZER CO., BOSTON, MASS.
2364	Americus Ammoniated Bone Superphosphate
2365	Americus Corn Phosphate
2366	Americus Potato Manure
1236	Royal Bone Phosphate for All Crops
2367	Williams & Clark's Potato Phosphate

Note.—While this bulletin was in press there was received from the Provincial Chemical Fertilizer Co., of St. John, N. B., the manufacturer's certificate for a Potato Phosphate, having the following guaranteed composition: Nitrogen, 2.88 per cent; available phosphoric acid, 8.00 per cent; potash, 6.50 per cent. The sample forwarded was received too late to allow the analysis to be inserted here.

Analyses of Manufacturers' Samples, 1900.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
2124	1.69	1.29	2.98	3.29	4.21	4.27	1.29	8.48	8.00	9.77	9.00	7.41	7.00
2123	.21	2.08	2.29	2.47	3.81	4.21	1.38	8.02	8.00	9.40	9.00	4.19	4.00
2346	1.00	.84	1.84	1.64	2.36	5.15	.99	7.51	6.00	8.50	7.00	6.91	6.00
2125	1.61	.79	1.80	1.64	3.80	3.54	1.15	7.34	7.00	8.49	8.00	2.60	2.50
1888	.38	1.65	2.03	2.00	2.00	5.19	1.74	7.19	7.00	8.93	9.00	5.58	5.00
1616	......	......	4.27	4.54	......	7.34	12.06	7.34	......	19.40	16.65	......	......
2347	.67	1.38	2.05	2.06	6.69	2.63	2.41	9.32	8.00	11.73	9.00	1.95	1.50
2348	1.20	1.26	2.46	2.47	6.77	3.06	1.97	9.83	9 00	11.80	10.00	2.43	2.00
2349	1.03	1.50	2.53	2.47	2.55	4.03	3.06	6.58	6.00	9.64	7.00	5.15	5.00
2350	.74	1.30	2.04	2.06	5.61	4.71	2.36	10.32	8.00	12.68	9.00	3.34	3.00
2351	.39	.64	1.03	1.03	5.44	3.14	1.46	8.85	8.00	10.04	9.00	2.61	2.00
2352	.42	2.28	2.70	2.47	4.59	1.89	1.25	6.48	6.00	7.73	7.00	10.94	10.00
1396	......	......	1.20	.83	3.39	1.55	.54	4.94	4.00	5.48	5.00	8.35	8.00
1397	......	......	1.15	.83	6.50	1.73	.92	8.23	8.00	9.15	9.00	4.33	4.00
2354	......	.20	.20	......	4.64	5.17	1.58	9.81	10.00	11.39	11.00	1.91	2.00
2355	.32	1.80	2.12	2.05	5.94	2.25	1.38	8.29	8.00	9.67	9.00	6.35	6.00
2353	.52	1.40	1.92	2.05	6.40	2.35	1.89	8.75	8.00	10.64	9.00	2.93	3.00
1410	......	......	4.00	3.70	3.02	6.39	2.51	9.41	7.00	11.92	9.50	10.52	9.50
1411	.....	......	3.96	3.70	2.60	5.54	2.84	8.14	7.00	10.98	9.00	9.18	8.50
2106	.52	1.72	2.24	2.00	5.31	4.03	4.14	9.34	9.00	13.48	10.50	3.33	3.00
2108	.63	1.55	2.18	2.00	5.50	4.18	4.08	9.68	9.00	13.76	10.50	5.57	5.00
1568	.....	.....	2.68	2.10	8.00	2.63	2.56	10.63	9.00	13.19	12.00	2.75	2.25
1891	.82	1.58	2.40	2.50	2.45	5.71	3.89	8.16	8.00	12.05	12.00	4.72	4.00
1892	......	1.02	1.02	1.50	1.34	7.11	3.67	8.45	9.00	12.12	12.00	12.43	12.00
2107	......	1.91	1.91	1.50	3.19	4.24	6.36	7.43	7.00	13.79	13.00	5.69	5.50
2356	.31	1.58	1.89	1.50	2.20	2.71	5.48	4.91	3.50	10.39	9.00	3.74	3.75
2357	.22	1.16	1.38	1.20	2.81	3.80	3.36	6.61	5.00	9.97	9.00	2.84	2.00
2358	1.16	.60	1.76	2.40	6.05	2.86	.73	8.91	6.50	9.64	9.50	7.89	7.00
2359	1.01	1.12	2.13	2.05	3.77	4.22	3.08	7.99	6.50	11 07	10.00	5.66	4.00
2360	.40	.36	.76	.40	1.83	3.73	.63	5.56	5.50	6.19	7.00	4.54	1.50
1414	....	......	1.33	.82	4.84	3.08	1.96	7.92	7.00	9.88	9.00	1.71	1.00
2361	.60	1.42	2.02	2.06	6.82	2.43	2.55	9.25	8.00	11.80	9.00	2.01	1.50
2362	.37	.70	1.07	1.03	5.31	3.03	1.44	8.34	8.00	9.78	9.00	2.10	2.00
2363	.82	1.20	2.02	2.05	5.65	5.16	2.40	10.81	8.00	13.21	9.00	2.93	3.00
2375	.93	1.18	2.11	3.25	1.98	2.79	1.88	4.77	6.00	6.65	7.00	7.03	5.00
2364	.95	1.32	2.27	2.47	6.72	3.08	1.94	9.80	9.00	11.74	10.00	2.35	2.00
2365	.56	1.42	1.98	2.06	6.75	2.85	2.29	9.60	8.00	11.89	9.00	1.95	1.50
2366	.64	1.32	1.96	2.06	5.52	4.89	2.23	10.41	8.00	12.64	9.00	3.03	3.00
1236	......	......	1.26	1.03	6.20	3.11	2.23	9.30	8.00	11.54	9.00	2.26	2.00
2367	1.02	1.50	2.52	2.47	2.56	4.07	2.94	6.63	6.00	9.57	7.00	5.46	5.00

THE CHIEF PROVISIONS OF THE FERTILIZER LAW APPLYING TO MANUFACTURERS, IMPORTERS AND DEALERS.

The law for the regulation of the sale and analyses of commercial fertilizers makes the following requirements upon manufacturers, importers or dealers who propose to sell or offer for sale commercial fertilizers in the State:

1. *The Brand.* Each package shall bear, conspicuously printed, the following statements:

The number of net pounds contained in each package.

The name or trade mark under which it is sold.

The name of the manufacturer or shipper.

The place of manufacture.

The place of business of manufacturer or shipper.

The percentage of nitrogen or its equivalent in ammonia.

The percentage of potash soluble in water.

The percentage of phosphoric acid in available form.

The percentage of total phosphoric acid.

2. *The Certificate.* There shall be filed annually between Nov. 15 and Dec. 15 with the Director of the Station a certificate containing an accurate statement of the brand. This certificate applies to the next succeeding calendar year. (Blanks for this purpose will be furnished on application to the Station.)

3. *Manufacturer's Samples.* There shall be deposited annually, unless excused by the Director under certain conditions, a sample of fertilizer, with an accompanying affidavit that this sample "corresponds within reasonable limits to the fertilizer which it represents."

4. *Analysis fee.* For each brand of fertilizer sold or offered for sale in the state there shall be paid annually to the Director of the Station "an analysis fee as follows: Ten dollars for the phosphoric acid and five dollars each for the nitrogen and potash, contained or said to be contained in the fertilizer."

5. *The license.* Upon receipt of the fee, the certificate and the sample (if required), the Director of the Station "shall issue a certificate of compliance."

[The full text of the law will be sent to those asking for it.]

[The papers which follow were prepared by Professor Harvey in the fall of 1899 before his illness, and were in press at the time of his death. C. D. W.]

NOTES ON INSECTS OF THE YEAR 1899.

F. L. HARVEY.

The year has been somewhat remarkable on account of the great abundance of several species of plant lice, leaf rollers and bud moths, and the great number of forest tent caterpillars. The important species of the year are considered below in notes or in greater length under special titles. The less important forms are merely mentioned in the table of insects (page 40) examined in 1899.

CHINCH BUG. (*Blissus leucopterus*). The chinch bug is reported as being quite abundant on the farms of Mr. Chas. Evans and Mr. W. L. Howe and others in the intervale lands near Fryeburg. It attacks herdsgrass, eating the bulbous bases of the stems after haying, requiring reseeding. Figured on page 111 of Report of this Station for 1894.

DESTRUCTIVE PEA LOUSE. (*Nectarophora destructor,* Johnson). This new species of pea aphis was very abundant in Maine the past season, doing much damage to garden and field peas.

CUCUMBER PLANT LICE. Plant lice were very abundant on squashes and cucumbers the past season, doing much damage. The common species, *Aphis gossypii,* was responsible for most of the injury, though another species common on rough amaranthus was also found on squashes.

THE CORN LOUSE, (*Aphis maidis*), was abundant on sweet corn in some parts of the State.

DOBSON FLY. HELGRAMITE. (*Corydalis cornuta*). The nymphs as well as the flies of this species have been received several times for examination, indicating that the species is abundant in Maine waters. The nymph is the well known bass bait. The nymphs and flies are both large and attract attention. The former is the terror of smaller water insects, while the latter is conspicuous by its large head, powerful jaws, and long coarsely nerved wings.

THE LESSER LEAF ROLLER. (*Teras minuta*). The specimens examined were bred from apple foliage. It also attacks cranberries and huckleberries and is one of the fire worms of cranberry bogs. It is considered in detail in Bulletin 56 of this Station.

THE OBLIQUE-BANDED LEAF ROLLER. (*Cacœcia rosana*). This was bred from the foliage of apple trees sent by Mr. Chas. S. Pope, Manchester. It is a new apple insect in Maine, at least we have not seen it before on apples. We reared the moths from currant leaves in 1894.

AMERICAN ELM PLANT LOUSE. (*Schizoneura americana*). This insect was abundant about Orono, Bangor and Augusta.

Work of the elm plant louse.

Work of the eye-spotted bud moth.

EYE-SPOTTED BUD MOTH. (*Tmetocera ocellana*). The moth was bred abundantly from apple twigs. It has done much damage to the flower and leaf buds and foliage of apple trees the past season. It is considered in detail in Bulletin 56 of this Station.

CHERRY TREE UGLY-NEST. (*Cacœcia cerasivorana*). This is a new apple insect for Maine. It was reported, also, as feeding upon choke cherry, its more common food plant, and upon hazelnut. The conspicuous nests are common on choke cherry bushes in Maine, but uncommon on apples.

APPLE BUCCULATRIX. (*Bucculatrix pomifoliella*). The cocoons of this insect were received from Mr. L. F. Abbott of the Lewiston Journal, who reports them abundant in Lewiston. He also reports having seen them at Wilton, Jay and Livermore. For detailed account see Bulletin 56 of this Station.

THE AMERICAN TIGER MOTH. (*Arctia americana*). This was found on beets in a garden. It is not a common species in Maine. The fore wings are brown with white bands, the hind wings orange with round black spots. The moth has nearly three inches spread of wing. The beet belongs to the same family as the pigweeds (*Amaranthus*) upon which some tiger moths feed.

SPHINX MOTHS were quite abundant the past season. The elm sphinx was abundant on elms; the grape sphinx (*Philampelus achemon*) reported on grapes; the twin-spotted sphinx on apple. These insects are not usually abundant but the larvæ are capable of doing much damage on account of their large size and voracity.

THE STALK BORER. (*Gortyna nitela*). Specimens of strawberries containing the half grown larvæ of the above species were received from Buxton. The caterpillars were entirely buried in the berries. This habit is not new to entomologists, but so far as we know has never been observed before in this State. It has been detected boring into potato vines in Maine.

The usual number of specimens of *Cecropia, Promethea* and *Polyphemus* moths were reported. All were found in the cocoon or larval form upon apple trees. Cecropia was also reported feeding on plums.

THE VELLEDA LAPPET MOTH, though not an abundant insect in Maine, continues to be reported as doing some injury to plums. The books give the apple, poplar and other plants as its most common food. It is called the lappet moth because the caterpillar has a flat lobe or lappet on the sides of each segment. These lobes are provided with long hairs, giving the caterpillar a fringed appearance. When at rest the larvæ lie close to the branches and are hard to find.

THE FOREST TENT CATERPILLAR was very troublesome the past season in southern and western Maine. Many articles appeared in the papers of the State regarding them. The Station issued a newspaper bulletin on the insect and the writer prepared an article for a bulletin issued by the State Board of Agriculture. It will be impossible to treat this insect in the forests, but an effort ought to be made to prevent its ravages upon ornamental and orchard trees.

THE FALL CANKER WORM, though reported from the center of the State, did not do great damage the past season and has become scarce about Orono.

THE MONARCH BUTTERFLY. (*Anosia plexippus*). This was unusually abundant the past season in the center of the State. The pale green chrysalids with golden spots on them are very beautiful objects and sure to attract attention. This large brown butterfly has black-veined wings on the black borders of which are many white spots. The larvæ feed on the milkweed. It is believed that the species dies out each season in the northern states and that the butterflies migrate from the south each spring. We have seen masses of this species as big as a bushel basket clinging together on the branches of a tree.

THE MOURNING CLOAK BUTTERFLY was exceedingly abundant the past season. It is a very bad elm tree insect, doing much damage to the shade trees in villages and cities. It is described in Experiment Station Report, 1888, p. 187.

THE DRONE FLY. (*Eristalis tenax*). This species was reported as being found about bee hives. These flies feed upon pollen and honey. They may have been attracted to the hives by the odor of the honey, but they would not venture into the hive and could do no harm.

ANTHOMYIID FLIES, probably *Pegomyia vicina*, were reported as doing much damage to the beet leaves in gardens. The larvæ of these flies work between the upper and under surface of the leaves, eating the leaf pulp and leaving whitish trails, not only injuring their functions but rendering them unsuitable for greens.

THE CURRANT FRUIT FLY. (*Epochra canadensis*). This species which has done so much injury about Orono was reported from Augusta, the past season. It attacks the fruit of the currant, causing it to turn red early, and drop prematurely. See Experiment Station Report, 1895, p. 111.

THE BUFFALO CARPET BEETLE has been reported the past season from seven localities, representing every section of the State. For a consideration of this insect see Experiment Station Report, 1894, p. 115.

THE STRIPED SAP BEETLE. (*Ips fasciatus*). The last of June the following letter accompanied by specimens was received from Mrs. J. K. Garland, Eden, Maine: "I send you an insect that is killing my locust trees. It works on the trunk of the tree boring under the bark. In ten days it has apparently killed one tree and is attacking others. Is there anything that will destroy them? Will they be likely to attack maples and elms?"

The specimens received were the above species, an insect that has never been accused of more serious depredations than sucking the exuding sap from wounds on trees produced by mechanical injury, or insect depredations. Although we did not see the trees we feel sure they were suffering from attacks of borers and the sap beetles were there to feed upon the sap exuding from the borings.

THE MAY BEETLE continues to do damage in grass lands. The large white grubs of this species are the larvæ of the well known June bug. They feed upon the roots of grass and other plants, often doing great damage.

THE CHERRY LEAF BEETLE. (*Adimonia cavicollis*). This beetle was reported as doing much damage to the foliage of cherry trees. The species is common about Orono. It is reddish brown in color and about three-sixteenths of an inch long.

BEAN WEEVILS were reported as feeding upon stored beans. This pest seems to be widely distributed in Maine.

LARRID BEES. Last September we received a box of specimens from Mr. F. A. Campbell of Cherryfield and the next day specimens of the same insect from Mr. B. F. Grace of West Harrington. Mr. Campbell says his specimens "were dug from a gravelly, loamy hillock in a pasture. They have been known in the locality for three years. Over an area of 100 feet by 30 feet the ground is completely perforated with small holes the size of a pea and with a little earth around the entrance. In the middle of the day when it is sunny it is said they swarm over the hillock in great numbers making a noise with their wings that can be heard several hundred feet in the woods which surround the hillock. They are supposed to be Italian bees by some, but if so, their habits are different from what I supposed. Some would like to dig for a ton of honey, but we shall not have them disturbed until we hear from you." Mr. Grace confirms the above account. The specimens sent were land bees and were accompanied by cells filled with *bee bread,* the pollen of plants, probably stored as food for the young bees. The larrids usually store their burrows with grasshoppers and related insects and are beneficial. The bee bread in this case had the smell of old cheese. There are fully fifty species of these sand bees in the United States and Canada, found mostly in the southwest. They do not make honey.

THE BROWN TAIL MOTH. (*Euproctis chrysorrhœa*).

F. L. Harvey.

Specimens of the brown tail moth were taken the past season on Cut's Island, Kittery Point, Maine, by Mr. Charles Elliott Thaxter. He thinks they were imported from Cambridge, Mass., in household goods and that they have been on the island for two years and are probably established. This insect was reported from South Berwick, Maine, in 1897, but we were in doubt as we did not see specimens. (See Experiment Station Reports, 1897, p. 175 and 1898, p. 126). Mr. Thaxter kindly sent us a specimen taken by him as stated above. This dangerous insect enemy of the pear and many other trees, herbs and shrubs has to be added to our long list of insect pests.

Distribution and History. The brown tail moth is a native of the eastern continent, occurring in Europe, Northern Africa and Asia Minor. In the United States it was first called to the attention of the Gypsy Moth Commission of Massachusetts in May, 1897, at Somerville, Mass. Investigation showed that it had been in that region for at least three years. How it was introduced is not known. The first knowledge the Experiment Station had of its appearance in Maine was the following letter from Mr. Sessions of the Gipsy Moth Commission of Massachusetts:

"We are now making an inspection of the territory infested with our new imported pest, the brown tail moth (*Euproctis chryssorrhœa*). Our inspector in discharge of his duty called on Dr. Geo. E. Osgood of No. 283 Highland Avenue, Somerville.

The doctor is one of the reliable physicians of Somerville. His place is infested with the moth. He said that he saw the brown tail moth in South Berwick, Maine, while on his last summer's vacation, and was sure that it was identical with the Somerville pest. He also said that while he was in South Berwick he professionally treated two cases of poisoning by contact with the moth and that the symptoms of the patients were identical with those of his Somerville patients who had been poisoned by the brown tail moth. The premises in South Berwick are owned by the doctor's father-in-law, Andrew Whitehouse, 10 Goodwin St., South Berwick. I send you notice that you may take such measures as you think proper in the case."

We have no doubt but what Dr. Osgood's observations were correct, although we were not able to secure specimens at the time or since. Mr. Whitehouse wrote us in 1898 as follows: "I cannot find any specimens to send you. In the summer of 1897 my boy was badly poisoned by them. They were numerous on a woodbine on my premises and a few on my fruit trees. Last year I cut down the woodbine and burned it and have not seen any since." Mr. Whitehouse may have destroyed the colony, at least it is to be hoped that he did. He thinks they were imported on roses from Somerville, Mass.

Charles Elliott Thaxter writing under date of July 14, 1899, from Cut's Island, Kittery Point, Maine, says, "My father thinks that you would be interested to know that we have caught two brown tail moths this month, one on the wing July 3d, and another at rest July 12. My father thinks the cocoons or caterpillars must have been brought here from Cambridge two summers ago on our househould goods, as brown tail moths were very plentiful about our house in Cambridge while we were packing. My father feels sure that they were not brought this year and thinks that they are likely to have become established on this island." We requested Mr. Thaxter to send us a Maine specimen of the moth and he did so. Food plants of the moth in Europe are the apple, pear, plum and rose of the rose family, and a number of forest trees. In this country it seems to prefer the pear but has been found feeding upon between thirty and forty herbs, shrubs or trees including many families, showing it to be a general feeder.

The following account of the life history of this insect is taken from a special bulletin issued July, 1897, by the Massachusetts Experiment Station.

DESCRIPTION.

"The eggs are laid in July, in masses of from 200 to 300, usually on the under side of the leaves, and are covered with the brown hairs from the end of the abdomen. They hatch in a short time and the young caterpillars feed during the rest of the season on the surface of the leaves, leaving in a few days only the skeleton. While still young they begin to make a regular dwelling in which they hibernate during the winter. This habitation is constructed at the ends of the twigs and is made by drawing together a few leaves, lining them with silk and surrounding them with a mass of silken threads. These tents are so firmly fastened to the twigs that they cannot be removed without using considerable force.

"Before the leaves begin to grow in the spring, the young caterpillars emerge from their winter retreat and often feed on the swelling buds. They reach their full growth in the early part of June and transform to pupæ. In a lot of about eighty, bred in confinement, the last one pupated June 18.

"The full grown caterpillars are from an inch and a quarter to an inch and three-quarters in length. The head is pale brown, mottled with dark brown, with reddish brown hairs scattered over the surface. The body is dark brown or black with numerous fine, dull orange or gray spots over the surface, most pronounced on the second, third and fourth segments. Long, reddish-brown, finely barbed hairs arise from all the tubercles, and white branching hairs arise from the upper side of the lateral tubercles on segments 4 to 12 inclusive. These white hairs form elongated white spots along each side and are one of the most striking characteristics of this caterpillar. The subdorsal and lateral tubercles on segments 4 to 12 inclusive are covered with fine short spines of uniform length. There is a vermillion red, retractile tubercle on the top of the tenth, and a similar one on the top of the eleventh segment.

"When the caterpillars are done feeding they change to pupæ among the leaves, two or more often transforming together, spinning an open cocoon of coarse silk. The pupæ are about three-fourths of an inch in length, dark brown in color, and with fine yellowish brown hairs scattered over the surface. In a short time the moths emerge from the cocoons and after mating lay their eggs.

"The males are pure white with a satin-like luster on the fore wings, a reddish brown tuft at the end of the abdomen and sometimes there are a few black dots on the fore-wings. The antennæ are white and fringed with pale yellowish hairs. They measure about an inch and a quarter between the tips of the expanded wings.

"The females are of the same color as the males, except that they have no black spots on the wings, the anal tuft is larger and lighter in color and the antennæ are shorter and have shorter fringes. Expanse of wings, about an inch and three-quarters."

HABITS OF THE CATERPILLARS.

The young caterpillars of the brown tail moth, after hibernating in the tents which they construct at the tip of the branches, emerge in the spring and feed downward towards the main branches and trunk, leaving the naked twigs bearing the gray tents at the ends, a conspicuous evidence of the presence of this insect. They eat the entire leaf except the midrib, and, in leaves having strong ribs, like those of the sycamore maple, all the larger ribs are left untouched. When the caterpillars are numerous they devour not only the buds, leaves and blossoms, but even the green fruit.

One of the most annoying features of this caterpillar is the painful irritation or nettling caused by the insects when coming in contact with the skin. The hairs of the caterpillar are brittle and easily become detached, and when they come in contact with the skin, produce a most intense irritation. From this cause many persons have suffered so severely as to require the aid of a physician. The invasion of houses by these insects is a common occurrence, and not unfrequently they make their way into the sleeping apartments

INSECTS EXAMINED IN 1899.

Common Name.	Technical Name.	Locality.	Remarks.
Bristle Tail	*Lepisma*	Riverside.	About in cupboards.
Chinch Bug	*Blissus leucopterus*	Fryeburg.	Quite bad in grass land.
Squash Bug	*Anasa tristis*	North Livermore.	On squash and pumpkin vines.
Dog-day Harvest Fly	*Cicada tibicen*	Eliot	Taken on apple limb making incisions.
Pernicious Pea Aphis.	*Nectarophora destructor*	Orono. Kennebunkport. Brunswick.	On cultivated peas. Very abundant.
Cucumber Plant Louse.	*Aphis gossypii*	West Eden. Belfast. Orono.	On cucumbers.
American Elm Plant Louse	*Schizoneura americana*	Orono. Bangor. Augusta.	Abundant on elms.
Dobson Fly. Helgramite	*Corydalis cornuta*	Auburn. Costigan.	Common water insect used as bait for bass.
The Lesser Leaf Roller	*Teras minuta*	Manchester	Rolling foliage of apple trees.
The Oblique-banded Leaf Roller	*Cacœcia rosana*	Manchester	Attacking the foliage of apple trees.
Eye-spotted Bud Moth.	*Tmetocera ocellana*	Manchester. Augusta	Destroying buds on apple trees.
Cherry Tree Ugly-nest	*Cacœcia cerasivorana*	Washburn	Feeding on apple, choke cherry and hazel nut.
Apple Bucculatrix	*Bucculatrix pomifoliella*	Lewiston	Specimens taken at Lewiston, Wilton, Livermore and Jay.
The Potato-stalk Borer	*Gortyna nitela*	Buxton	Boring fruits of the strawberry.
American Tiger Moth	*Arctia americana*	Gardiner	On beets in garden.
Elm Sphinx	*Seritomia quadricornis*	Harmony. South Dover	On elms and on pinks in garden.
Hawk Moth. Sphinx Moth	*Philampelus achemon*	Gardiner. North Livermore	On grapes.

THE TWIN-SPOTTED SPHINX	*Smerinthus geminatus*	Orono	A common apple insect.
ROSY DRYOCAMPA	*Dryocampa rubicunda*	Foxcroft	On clover.
CECROPIA EMPEROR MOTH	*Samia cecropia*	Lagrange Readfield Kenduskeag	Plentiful on apples. One specimen on plum foliage.
PROMETHEA MOTH	*Callosamia promethea*	Machias	On apple trees.
POLYPHEMIS MOTH	*Telea polyphemus*	Stroudwater Hampden	On apple trees.
BROWNTAIL MOTH	*Euproctis chrysorrhœa*	Kittery Cuts Island	This dangerous moth has appeared in Maine.
VELLEDA LAPPET-MOTH	*Tolype velleda*	Troy	On plum.
FOREST TENT CATERPILLAR	*Clisiocompa disstria*	All sections of State.	On shade trees in alarming numbers.
FALL CANKER WORM	*Alsophila pometaria*	Augusta	Larva on trees.
MONARCH BUTTERFLY	*Anosia plexippus*	Monmouth Cornish North Anson Fairfield Centre	Received in the chrysalid stage mostly.
MOURNING CLOAK BUTTERFLY	*Euvanessa antiopa*	Augusta Livermore Falls Skowhegan	On elms.
DRONE FLY	*Eristalis tenax*	South Carthage	About bee hives. Not predaceous.
ANTHOMYIID FLY	*Pegomia vicina*	Union	Mining beet leaves.
THE CURRANT FRUIT-FLY	*Epochra canadensis*	Augusta	Infesting the fruit of currants.
CARPET BEETLE	*Anthrenus scrophulariæ*	All parts of the State.	Attacking carpets.
THE STRIPED SAP-BEETLE	*Ips fasciatus*	Eden	On locust trees sucking sap which exuded from wounds made by borers.
MAY BEETLE	*Lachnosterna fusca*	Cherryfield Walpole	In pastures.
THE CHERRY LEAF BEETLE	*Adimonia cavicollis*	Lewiston	Working on foliage of cherries.
BEAN WEEVIL	*Bruchus obtectus*	York Corner East Lebanon	Working in dried beans.
PIGEON TREMEX. PIGEON HORNTAIL	*Tremex columbo*	Sabattus	Working on elm and other trees.
PELECINUS	*Pelecinus polyturator*	Winterport	A black ichneumon with a long slender pointed abdomen which is usually curved.
LARRID BEE	*Larra*	Harrington West Harrington.	Burrowing in the ground.

The caterpillars are quite gregarious up to the later stages of their growth, when they disperse to some extent; but when they occur only in moderate numbers, they retain their gregarious habits to a greater degree than when they are very abundant, since in this case the supply of food is soon exhausted and they are forced to migrate. When these caterpillars molt they gather in masses on the branches and cover themselves with a scanty mass of silk. When preparing to change to the pupal stage several of the caterpillars spin up in a common cocoon within the leaves at the tip of the branches. When numerous, they frequently pupate in masses under fences and clapboards, or on the trunks and larger branches of the trees.

The webs of the brown tail moth should not be confounded with those of the tent caterpillar or the fall web worm. They may be distinguished from those of the tent caterpillar by being placed at the tips of the branches, while the tent caterpillar constructs its tent in a fork of the limbs. This latter insect rarely, if ever, attacks the pear which is a favorite food plant of the brown tail moth. The fall web worm, while often found on pear trees, spins a large open web at the ends of the branches and feeds within this web. This insect does not appear until after the brown tail moth has ceased to do damage.

Precautions. This pest does a great amount of damage in Europe where laws are enacted to hold it in check. The Commonwealth of Massachusetts has enacted a law looking to its suppression in that state and made an appropriation and put the matter into the hands of the Gypsy Moth Commission. Now that it is probably locally established in Maine immediate action should be taken to prevent its spreading. A careful inspection should be made of the localities where it has been found.

NOTES ON PLANTS OF 1899.

F. L. HARVEY.

The past season was dry and the conditions unfavorable for the growth and spread of fungi and only a few were reported. The apple scab and potato blight were not as bad as usual. This was due in part to the dry season and probably in part to the greater amount of spraying done. There was not the usual number of weeds sent for determination and no new weeds are known to have been introduced the past season. Specimens of the following plants, mostly sent for identification, were received in 1899.

BLADDER CHAMPION. (*Silene vulgaris*). This plant seems to be increasing as a weed in cultivated fields.

SILVERY CINQUEFOIL. (*Potentilla argentea*). This is a common plant on rocky ledges in Maine and is spreading along roadsides in many places. It attracts attention on account of the silvery pubescence on the under side of the leaves.

BIENNIAL EVENING PRIMROSE. (*Œnothera biennis*). This tall weed, with bright yellow four-petaled flowers, is one of the most common in the State. It seeds heavily and growing in waste places is able to maintain itself. Its tall woody stems covered with four-celled pods are a common sight in winter.

GOLDEN ALEXANDERS. (*Thaspium trifoliatum aureum*). This is a native plant and not reported before as a weed in fields. It is a perennial plant, usually growing in the woods and probably will be easily subdued by cultivation.

HOBBLE-BUSH. (*Viburnum lantanoides*). This is a native shrub, with beautiful foliage and attractive flowers. It is worthy of cultivation.

CULTIVATED DAISY. (*Bellis perennis*). Like many other cultivated plants this species escapes from cultivation and appears in fields. It has not proved a persistent or bad weed.

ORANGE HAWKWEED. (*Hieracium aurantiacum*). This weed has been almost entirely destroyed on the college grounds by turning the grass land where the weed was thick and harrowing frequently through the season. Scattering plants in the fields were pulled and burned and the ground where they grew salted.

CANADIAN HAWKWEED. (*Hieracium canadense*). This is a coarse, leafy-stemmed weed, growing fully four or five feet high on good soil and bearing at the top a corymb of yellow beads. It is native, and though sometimes found in fields, it has not shown a tendency to spread like its relatives, the orange hawkweed and king-devil weed.

RAGGED KNAPWEED. (*Centaurea Jacea*). This fugitive from Europe is common in some pastures of Maine, in fields and waste places. The large heads and the fimbriated outer bracts make it a conspicuous plant, sure to attract attention.

THE SAND BUR, BEAKED NIGHT SHADE. (*Solanum rostratum*). The sand bur is reported as occurring in fields. This objectionable weed has been found several times in Maine, usually about where cars of western grain were unloaded. It is more of a roadside weed in the West. It will probably not maintain itself in cultivated fields in Maine.

THE RATTLE-GRASS. (*Rhinanthus Crista-Galli*). This is a bad weed in sandy lands along the coast. There is probably no way to get rid of it, but by careful culture. It seeds profusely.

REED GRASS. (*Phragmites Phragmites*). This grass was received from Kenduskeag. It is rare in Maine, growing in wet places, and so we record the locality. It is sure to attract attention on account of its high and beautiful plumes. It grows from five feet to fifteen feet high and bears a silvery plume from six inches to a foot in length.

THE MAINE EXPERIMENT STATION.

CHAS. D. WOODS.

The Legislature of 1885 enacted the law establishing the Maine Fertilizer Control and Agricultural Experiment Station. The purpose of the Station was defined in Section 1 of the Act (Chapter 294 Public Laws of 1885) as follows: "That for the purpose of protection from frauds in commercial fertilizers, and from adulterations in foods, feeds and seeds, and for the purpose of promoting agriculture by scientific investigation and experiment, the Maine Fertilizer Control and Agricultural Experiment Station is hereby established in connection with the State College of Agriculture and Mechanic Arts."

This act was approved by the Governor March 3, 1885, and early in April the Station was organized with a Board of Managers consisting of:

Prof. Walter Balentine, Professor of Agriculture in the Maine State College; Hon. Z. A. Gilbert, North Greene, Secretary of Maine Board of Agriculture; Benj. F. Pease, Cornish; Hon. S. L. Boardman, Augusta; and William Downs, Sebec. The officers of the Station consisted of Whitman H. Jordan, Director and Chemist; Jas. M. Bartlett, Assistant Chemist; Gilbert M. Gowell, Superintendent of field and feeding experiments.

The Station was dependent for its quarters upon the hospitality of the Maine State College. A chemical laboratory was partitioned off from the main college laboratory and supplied with apparatus. Part of the dairy room of the college was fitted up with apparatus for use in experiments involving the handling of milk. A part of the new barn just erected by the college was turned over to the Experiment Station for feeding experiments and was fitted up with stalls, scales, etc. Field experiments were started by laying off about three acres of land into plots, and box experiments for growing plants were also begun.

While the principal object of the establishment of this station was the maintenance of a fertilizer control, in the first months of its existence lines of investigation were entered upon which have been followed by the Station from that time.

Dr. Jordan was Director of the Station from 1885 to June 30, 1896, when he resigned to take the directorship of the New York Experiment Station. Mr. James M. Bartlett was appointed assistant chemist at the establishment of the Station and a year later Mr. Lucius H. Merrill was also appointed as assistant chemist. Both of these gentlemen have been associated with the Station continuously since their first appointment. Mr. Gilbert M. Gowell was appointed superintendent of field and feeding experiments and he still continues with the Station in the department of stock breeding and poultry.

THE REORGANIZATION OF THE STATION.

The Maine Fertilizer Control and Agricultural Experiment Station existed about two and a half years and issued twenty bulletins and three reports, the former being published only in the leading papers of the State and the later as a part of the report of the Maine Board of Agriculture. Upon the passage by Congress of what is known as the Hatch Act, establishing agricultural experiment stations in every state, the Legislature of 1887 repealed the law of March 3, 1885, by an act which took effect October 1, 1887. It was expected at the time this act was passed, that by October first a station would be in operation under the provisions of the national law. This did not prove to be the case, owing to the failure of Congress to appropriate money, and had not the College assumed the risk of advancing the funds to pay the expenses of the Station, work would have ceased on the date in which the old station law stood repealed. As it was, work was continued until January, 1888, when the station force disbanded to await the action of Congress. It was not until after the passage of the deficiency bill early in February, 1888, that funds became available for the payment of the expenses of the year 1887-1888. Prior to this, the Maine Legislature of 1887 had accepted the provisions of the Hatch Act on the part of the State, and at the meeting of the College Trustees in June, 1887, the present Station was organized as a department of the College by the election of a director and two other members of the staff of officers.

At a meeting of the trustees, held February 16, 1888, a general plan for carrying out the provisions of the Hatch Act, involving the expenditure of $15,000 per annum, was presented to the Board of Trustees and was accepted by them, and the development and management of the Station under this plan was placed in the charge of a Station Council, made up of the President of the College, the Director of the Station, the heads of the various departments of the Station, three members of the Trustees and a representative from the State Board of Agriculture, the State Pomological Society and the State Grange.

The Station Council meets once a year and out of town members have their travelling expenses paid. At this meeting, the Director and other members of the station staff outline the work which has been undertaken in the past year and make recommendations for the following year. Such of these as commend themselves to the Station Council as well as suggestions from that body are approved and the Director is instructed to carry them out in detail. The appointment of members of the staff is made by the Trustees, and the recommendations of the Council are subject to their approval.

The Director is the executive officer of the Station and passes upon all matters of business. The members of the staff have charge of the lines of work which naturally come under their departments.

RELATION OF THE STATION TO THE UNIVERSITY.

When the legislature accepted the Hatch grant, it made the Experiment Station a part of the University. As the University is a state institution, it (including the Experiment Station) is under the same inspection as other departments of the State. The agriculture of the University is organized as the College of Agriculture, and includes both the instruction in agriculture and the work of investigation. The Professor in charge of the College of Agriculture is also the Station Director. Formerly the Experiment Station had a farm of about thirty acres and the remainder of the land was under the management of the University. In 1897, the whole farm was placed under the management of the Station. Its accounts are kept entirely distinct from the University and from the Hatch fund accounts. Both the University and the Hatch fund make appropriations, one for the privileges of instruction, the other for maintaining the experimental work. By this consolidation there was made a marked reduction of the expenses of the farm. After the College of Agriculture has used what facilities it may need for the purpose of instruction and the Experiment Station has used the land and animals needed for investigations and experiments, the remainder of the farm and livestock are handled for profit.

EQUIPMENT OF THE STATION.

The equipment of the Station consists of an office and laboratory building 60x25 feet and a wing 20x22 feet, constructed of brick with granite trimmings. The basement and first floor of this building are devoted to chemical laboratory purposes and the upper floor contains the laboratory of the veterinarian and the station offices.

In this building there are thoroughly equipped analytical laboratories for investigations of foods and feeding stuffs, fertilizers, soils, etc.

The Horticultural Building consists of a head-house, three green houses and a potting house. The plant covers over 6,000 square feet of surface and is used for the purpose of investigation and that of instruction. The head house contains the offices of the professor of horticulture and his assistant, work room, store room, and photographic rooms, as well as rooms for the station janitor.

The Dairy Building is a wooden building 50x42 feet, containing on the first floor a butter room, a cold storage room, a cheese room, a milk room and a boiler room. On the second floor is a lecture room, offices, and a cheese curing room. The apparatus includes hand and power separators of several different forms, creamers, hand and power churns and butter workers, cream and cheese tempering vats, weighing tanks, hand and power Babcock milk and cream testers of different makes, Russell pasteurizing apparatus, milk aerator, and the other appliances necessary. Power is furnished by a 6-horse power engine and by a baby tread horse power. This building is used by the Station and the College of Agriculture.

The upper barn is 40x100 feet. It has a solid stone foundation, resting directly upon the underlying ledge. The tie-up is on the south side of the main floor, and contains seventeen stalls, solidly constructed of birch. The barn contains scales for weighing experimental cattle, bins for the rations of experimental animals, rooms for grain, for storage and for digestion experiments, and a silo. The walls and partitions are of spruce sheathing.

The lower barn is 50x100 feet and has a storage capacity of 150 tons of hay. It contains a tie-up recently rebuilt, consisting of twenty-six stalls of a new and improved pattern, two grain rooms, two bull rooms, nursery, calf room, and silo. The silo is thirty-six feet deep and will contain 100 tons of cut corn. The basements of the barns contain manure cellars, store rooms and pens for swine.

The other buildings consist of a hospital barn, 25x40 feet; a two-story tool house, 25x60 feet; a horse barn 30x40 feet; sheep barn 20x120 feet; poultry breeding house, 16x150 feet; twelve poultry brooder houses, 8x10 feet. The farm contains eighty acres under cultivation and about forty acres in pastures and paddocks, varying amounts of which are used for experimental purposes. The livestock consists (April, 1900) of 5 horses; 32 cows; 20 calves and yearlings; 2 bulls; 48 swine and pigs; 67 sheep and lambs; 500 hens. Part of all the above are under experiment.

The Station has quite an extensive collection illustrating the economic botany and entomology of the State. The Station library conists of 1,200 volumes. In addition to its own books, the Station has access to the scientific library of the University and also to the State library at Augusta.

The Station is well equipped in apparatus, particularly that which has to do with chemical, botanical, entomological and horticultural investigations. The farm department is unusually well supplied with modern farm machinery.

INCOME OF THE STATION.

The revenue of the Station prior to 1888 was $5,000 per annum from the State, and fertilizer fees, the total income being something over $6,000 a year.

At present, the annual income of the Station is about $22,000, $15,000 of which comes from the Hatch fund, something over $5,000 from the fertilizer and feeding stuffs control, and the remainder from miscellaneous business and sales of produce. The State makes no appropriation for the State. Its funds come entirely from the National Government and from fees and sales of produce.

THE OBJECT OF THE STATION.

The purpose of the experiment stations is defined in the act of Congress establishing them as follows:

"It shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural and artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective states or territories."

INSPECTIONS.

In accepting the provisions of the act of Congress, the Maine Legislature withdrew the state appropriation for the maintenance of the Station, and thereby did away with the original purpose of the Station so far as it related to the "protection from frauds in commercial fertilizers, and from adulterations in foods, feeds and seeds." In place of this, special laws regulating the sale of commercial fertilizers, concentrated commercial feeding stuffs and agricultural seeds, and the inspection of chemical glass-ware used by creameries, have been enacted. The Director of the Station is the executive officer of these laws; the Secretary of Agriculture is the prosecuting officer. The cost of the fertilizer inspection is borne by a brand tax, that of the feeding stuff inspection by a tonnage tax and that of chemical glass-ware by a charge for calibration.

DISSEMINATION OF INFORMATION.

The annual report and bulletins of the Station cover its operations and give a full account of all its work. Up to April, 1900, the Station has published 90 bulletins and 15 annual reports, making a total of nearly 3,500 pages of printed matter. These publications are regularly sent to about 8,000 persons resident in the State, and 1,500 outside of the State. The special calls for the bulletins require an edition of about 10,500 copies. The Station has 2,000 copies of its annual report and 10,000 copies are distributed by the Board of Agriculture bound with its report.

Each month the Station issues a special newspaper bulletin giving the meteorological report for the month, and from time to time it issues newspaper bulletins on special topics which are very generally printed by the press of the State. In a few instances the Station has sent posters on important matters, to railway stations, post offices, granges, etc., which have been very generally displayed.

The Station has a large correspondence chiefly with practical farmers in the State. Careful attention is given to all inquiries and it is believed that in this way the Station is increasingly helpful to the farmer. The Director and three members of the Station staff do more or less work in farmers' institutes and other lectures. While it is believed that this work is helpful, no more of it is done than seems to be necessary, as it encroaches upon the work of investigation.

THE WORK OF THE STATION.

While the Station carries on co-operative work, such as orcharding, blueberry culture, and field experiments with farmers in different parts of the State, most of its work of investigation is from necessity, carried on in its own laboratories, greenhouses, barns and fields. Its special investigations have been along the lines of the nutrition of plants, the nutrition of animals (including man), and injurious insects and fungi.

SOME OF THE MORE IMPORTANT INVESTIGATIONS AND THEIR RESULTS.

Detailed accounts of the work of the Station have been given in its publications; nevertheless it seems appropriate to briefly summarize some of the leading experiments and the results obtained. In thus doing no reference is made to the report or bulletin in which they were described. The report of 1896 contains a general index to all the publications prior to January, 1897, and the three later reports are each indexed. If any one cares to look up the original papers, they can in this way be readily found.

FERTILIZATION OF FLOWERS, WITH REFERENCE TO THE SECONDARY EFFECTS OF POLLINATION.

The subjects receiving particular attention thus far are (1) the immediate influence of pollen on the mother plant; (2) stimulating action of pollen and the effects of varying amounts; (3) agamic development of fruit.

Results: (1) Within certain restricted limits there is an immediate influence of pollen on the mother plant. The most important plants showing this influence are the pea, the kidney bean, and Indian corn. Sweet corn shows the immediate influence of foreign pollen more frequently than do the other races of corn. Cucurbitaceous and solanaceous plants have never been found to exhibit such influence. There appears to be no relation between the amount of pollen produced by a plant and the amount required for fecundation. In some species, notably the egg-plant, the bean, and the cucumber, the ovary developed in the entire absence of pollen; but in no case where pollen was withheld were perfect seeds formed. (2) The amount of pollen supplied was found to have an important bearing on the form and size as well as the quantity of fruit produced. The form and size of tomato fruits was found to be directly dependent upon the amount of pollen furnished—a small amount invariably resulting in small and deformed fruit. (3) Indications point to the possibility of distinct effects from two male parents when pollen is applied to the same stigma at different times.

EXPERIMENTS WITH THE TOMATO.

With the tomato the following questions were considered: Effect of early setting in the field; effect of trimming the vines; effect of bagging the fruit to induce early ripening; the effect of crossing; the cumulative effect of culture under glass. *Results:* It was found that a chill to tomato plants after setting is not necessarily fatal to success, and that, other things being equal, the earliness and productiveness of tomatoes are in direct ratio with the earliness of setting in the field. Trimming the plants, after a part of the fruit had set, increased the yield by more than one-third. The results from bagging the fruit were in general of a negative character. Crossing between small fruited plants of prolific habit and the ordinary large fruited type was found to be a promising method of securing a valuable type for localities where the season is short. The increase in yield of the Lorillard-peach cross over that of the pure Lorillard was nearly 50 per cent. A derivative hybrid between Lorillard and currant produced a type of special excellence for forcing. In some instances seed from plants grown under glass gave better results in house culture than did seed of the same variety grown in the field. Results were not uniform, however, and there appeared to be distinct varietal differences.

STUDIES WITH THE CABBAGE.

Cabbage studies included investigations as to the importance of deep setting of the plants; the effect of frequent handling; the effect of trimming at the time of setting. *Results:* Contrary to the general notion concerning the treatment of "leggy" plants, it was found that depth of setting had very little influence upon the size of the head. Plants handled three or more times invariably gave better results than those handled once or twice before the transfer to the field. Frequent transplanting increased the average size of the heads. Handling the plants in pots before setting in the field increased the percentage of marketable heads; but trimming the plants at time of setting appeared to be of no special importance.

EGG PLANT.

Egg plant studies included methods of culture; varieties; crossings. *Results:* It was demonstrated that with careful treatment the egg plant may be successfully grown in Central Maine,—the most important requisites being: early sowing; vigorous plants; late removal to the field; warm, rich soil. Most of the well-known varieties are too late for this climate, but early dwarf purple, early long purple and long white were satisfactory. Several crosses were made between white fruited and black fruited types. After four years of breeding it was found that no type sufficiently constant in color to be of commercial value was produced. There was, however, a marked increase in vigor and productiveness as a result of crossing. In the first generation the purple fruited types seem stronger in their power to transmit color to the offspring than do the white fruited types; and this law appears to hold whether the purple type is used as the male or female parent. In later generations the inherent strength of the white fruited types appears more strongly than in the first. In all cases the white fruited types appear stronger in the power to transmit form and productiveness.

CAULIFLOWER.

Work with the cauliflower included studies of the relative influence of pot and box culture of young plants; the effect of trimming at time of setting in the field; the effect of mulch as compared with frequent cultivation; a comparison of varieties. *Results:* Plants handled in pots were kept at a more nearly uniform rate of growth and produced a higher percentage of marketable heads,—this difference in some cases amounting to 20 per cent. As a result of trimming it was found that there was practically no difference in earliness nor in the size of head, while as a rule the per cent of heads formed was greater from plants not trimmed. In no case were as satisfactory results obtained from mulching as from frequent cultivation. Nearly all of the leading varieties have been grown, and it is evident that the cauliflower may be successfully cultivated in this region. The most valuable sorts are of the Dwarf Erfurt and Snowball type with Algers for late in the season.

RADISH.

With the radish, the principal questions considered have been the relative value of large and small seed; the effect of sub-watering in the greenhouse; the influence of different temperatures on period of maturity. *Results:* Large seed were found to produce from 30 to 50 per cent more first-class roots than did small seed from the same lot. The sub-watered section of the bench produced 12 to 16 per cent more first-class radishes than did the surface watered section. There was a much greater loss from damping off on the surface watered section. The crop matured earlier and was of better quality when grown in the tomato house, with a night temperature of 80 degrees, than when grown at a lower temperature.

THE PRODUCTION OF FOOD MATERIAL BY VARIOUS FODDER AND ROOT CROPS.

Several varieties of fodder corn and roots were grown to determine the relative amounts of digestible dry material produced. *Results:* The large variety of fodder corn greatly excelled the other crops in the production of total and digestible dry matter. The crops which rank next in the production of digestible dry matter are Hungarian grass and rutabaga turnips.

THE INFLUENCE OF MATURITY UPON THE COMPOSITION OF THE CORN PLANT.

Field corn was harvested at five different periods of growth, and the products analyzed. *Results:* During the thirty days before the mature crop was harvested there was a continuous and large increase in the percentage of dry matter. This was due to an actual growth of dry matter, rather than to a drying out of the water with a diminished weight of crop. The increase was largely from the growth of starch, sugar and allied bodies.

SPRAYING.

Spraying with fungicides and insecticides has received considerable attention. Among the questions studied are the following: The effectiveness of the treatment in producing perfect fruit; the relative number of windfalls on sprayed and unsprayed trees; the preparation of spraying mixtures; the best time for spraying. *Results:* All trees sprayed with arsenical poisons had a smaller percentage of wormy fruit than did the unsprayed. Paris green was found less injurious to the foliage than was London purple or white arsenic. A mixture of 1 pound Paris green in 250 gallons of water was effective in reducing the amount of wormy fruit, but a stronger mixture (1 pound to 100 gallons) was required to kill the tent caterpillar. The number of windfalls was greatly lessened by spraying with Paris green and the proportion of wormy fruit among the windfalls was also smaller from the sprayed trees.

It was observed that most often wormy fruits from sprayed trees are entered from the side or base, while in fruits from unsprayed trees the entrance at the calyx were largely in excess. Spraying trees three times with an ammoniacal solution of copper carbonate destroyed the apple scab fungus and resulted in saving 52 per cent of the crop. The most effective fungicide used was Bordeaux mixture and this is now generally used throughout the State.

INJURIOUS INSECTS.

The department of entomology and botany was established in the Station in 1898. The work of investigation has consisted of studies in the field and laboratory of the life histories of insects and plants of economic importance. This has resulted in an increased knowledge of old enemies and means of combating them and in the working out of the complete life history of Trypeta pomonella (apple maggot) and Epochra canadensis (currant fly), and the discovery of numerous facts regarding the habits of many other insects of economic or entomological importance. Work of this character cannot well be summarized in definite statements. The results are published in the annual reports beginning with 1888.

ACQUISITION OF ATMOSPHERIC NITROGEN—NITRAGIN.

The acquisition of atmospheric nitrogen by plants has received attention. A bibliography of the subject has been compiled and the special features of soil inoculation has been studied. In carefully sterilized soil several of the "nitragin" cultures were compared with each other and with tubercles from various leguminous plants. The plants used in the work included red clover, pea, bean, vetch and soja bean. *Results:* The experiments thus far carried on do not warrant the recommendation of germ cultures for leguminous crops. In very few cases did the culture of the specific germ of any given species give better results than did a culture of a nearly related type.

BOX EXPERIMENTS WITH FELDSPAR AS A SOURCE OF POTASH.

Results: Oats were able to draw from the feldspar enough potash for a large crop of grain.

BOX EXPERIMENTS WITH PHOSPHORIC ACID FROM DIFFERENT SOURCES.

Phosphoric acid was supplied to 18 different kinds of plants in three forms, viz., (1) acid phosphatic rock; (2) finely ground Florida rock; (3) roasted redonda (a native phosphate of iron and aluminum). *Results:* Plants differ in their ability to feed upon crude phosphates. In nearly every case the availability proved to be in the order above given. The use of the acid rock hastens the maturity of the crop. The solubility of a phosphate in ammonium citrate is not always a correct measure of its actual value to the plant.

EFFECTS OF DIFFERENT FORMS OF PHOSPHORIC ACID IN CROP PRODUCTION.

Results: For the first year the largest increase of crop was produced by soluble phosphoric acid. For the second and third years without farther addition of fertilizers, better results were obtained from the plots where stable manure and insoluble phosphates had been used.

THE RELATIVE UTILITY OF DIFFERENT FORMS OF PHOSPHORIC ACID IN FIELD EXPERIMENTS.

Results: The phosphoric acid of bone and South Carolina rock was quite freely appropriated by oats, peas and corn.

EXPERIMENTS IN FEEDING LAMBS.

The effects of liberal feeding versus moderate feeding for growing early lambs was studied. The results were very much in favor of liberal feeding. The sheep and lambs payed at the rate of $71.60 per ton for the extra grain used.

EXPERIMENTS IN FEEDING COLTS.

Oats were compared with other mixed grain foods for producing growth with the result that a greater growth was produced by the mixed grains and hay than with oats and hay.

EXPERIMENTS IN FEEDING SWINE.

Many feed experiments have been made with swine. The more important questions studied were:

(1) The value of corn meal compared with whole corn for growth.

(2) Raw versus boiled potatoes for growth.

(3) The most efficient ratio of nutrients in a ration.

(4) The relation between the nutritive ratio and character of the growth.

(5) The relative value of animal and vegetable protein.

(6) The effect of much water in food upon assimilation.

(7) Experiment in feeding different breeds. Two each of Berkshires, Cheshires, Poland China, Chester white, and Yorkshires were used. The rations consisted of wheat middlings and skimmed milk, liberally fed according to age of animal. Daily growth, Cheshires, 1.23; Yorkshires, 1.14; Chester white, 1.08 pounds; Poland China, 1.01; Berkshire, 1 pound.

Results: (1) The same weight of whole corn produced almost the same growth as when the corn meal was fed.

(2) The apparent value of potatoes is not materially increased by boiling.

(3) In six feeding periods comparing wide and narrow rations, (one having a nutritive ratio of 1 : 9.2 and the other a ratio of 1 : 5.5) it took nearly one-half more food to produce a pound of growth with the wide ration than with the narrow. Rations with nutritive ratio of 1 : 6, 1 : 5.6, and 1 : 3.6, 1 : 4.4 were compared. The two latter rations produced no better growth than the two former, showing that the added protein of the very narrow rations was not advantageous.

(4) The nitrogenous rations proved to be best not only for growth but for the fattening period. A mixture of pea meal or gluten meal and corn meal was much more efficient than corn meal alone for fattening.

(5) In the case of young pigs the animal food (skimmed milk) was superior to the grains, but with the older animals the amount of digestible nutrients seemed to be the measure of value.

(6) The amount of water taken with the food appeared to have no particular effect on the growth.

(7) The digestible food consumed for a pound of growth was as follows: Cheshires, 2.88 lbs; Poland China, 2.73 lbs; Yorkshire, 2.55 lbs; Chester white, 2.5 lbs; Berkshires, 2.45.

In the early stages of the experiment much less food was required for a pound of growth than in the later. Berkshire and Chester whites made a larger part of their growth during the first three months.

DIGESTION EXPERIMENTS WITH SHEEP.

Since the organization of the Station, digestion experiments with sheep have formed a prominent feature of its work. The experiments have been largely with the forage crops, grown in this State, although several mill products have been tested with other work. Seventy-one different digestion experiments with native or cultivated hays or grasses; 24 experiments with dry corn fodder; 20 experiments with silage corn; 10 experiments with roots and 20 with mill products have been made. The summary of the results of the digestion experiments then completed is given in the annual report of this Station for 1897.

In addition to determining digestion coefficients, in many cases other problems have been studied such as the relative digestibility of early and late cut hay, of green and dried grasses; of mature and immature corn fodder and silage; of fodder and silage from different varieties of corn and of the oat plant in different stages of maturity.

THE VALUE OF MANURE RESIDUE FROM CORN MEAL AND COTTONSEED MEAL WHEN FED TO SHEEP.

Results: The amounts of nitrogen, phosphoric acid, and potash in the manure residue stand in direct relation to the amounts of the same ingredients in the food. The urine contained nearly one-half the potash of the total excrement, one-half to three-fourths the nitrogen, but no phosphoric acid.

EXPERIMENTS IN FEEDING STEERS FOR GROWTH.

(1.) A comparison of the economy of feeding a ration of hay and corn meal with a ration of oat straw, corn meal and cottonseed meal. *Results:* The steers fed the oat straw and mixed grain ration made the cheaper growth. The two rations contained about the same digestible nutrients and produced about the same amount of growth, the difference being in the cost of the rations.

(2.) Economy in quantity and composition of the foods used. Ten steers about eighteen months old of uniform size were divided into five pairs and fed five different rations. A, a maintenance ration; B, a moderate but wide grain ration; C, a moderate well balanced ration; D, a liberal well balanced ration; E, oat straw substituted for hay with moderate, well balanced grain ration. *Results:* It required nineteen pounds hay to 1,000 pounds live weight to maintain an animal without loss. The cost of producing a pound of growth was least when a liberal well balanced ration was fed. The substitution of nitrogenous foods in the rations greatly diminished the cost of production.

(3.) A comparison of the feeding value of corn silage with hay. Six steers were used in the experiments. Moderate grain rations were fed. *Results:* A pound of digestible matter from the corn silage produced somewhat more growth than a pound of digestible matter from the hay, but the difference was slight. The digestible matter appeared to be the measure of value of the foods.

THE RELATION OF FOOD TO THE GROWTH AND COMPOSITION OF THE BODIES OF STEERS.

The experiment had for its object a study of the effect of widely different rations upon the rate of growth and composition of the bodies of steers. Beginning at the age of four to six months, two pairs of steers were fed from seventeen to twenty-seven months on rations differing widely in their nutritive ratio, one ration having a ratio of 1 : 5.2 and the other 1 : 9.7. One pair ate 1884 pounds of digestible protein in the same time the other pair ate 1,070 pounds.

One steer of each pair was slaughtered and analyzed at the end of seventeen months feeding, the remaining steers being fed for ten months longer, when they were killed and analyzed. The chemical analysis included the entire bodies, excepting the skin and the contents of the stomach and intestines.

Results: At the end of fifteen months feeding, the pair of steers fed on the ration richer in protein had gained 221 pounds of live weight more than the pair fed the ration less rich in protein. The later growth with two steers showed a difference in favor of the ration less rich in protein.

The relative weights of organs and parts of the body was practically the same with the steers of the same age, independently of the ration.

The kind of growth caused by the two rations, viz., the proportions of water, protein, fat and ash, was not materially different with the steers of the same size. This is true whether we consider the entire bodies, the dressed carcasses or the edible portions of the carcasses. With steers fed for the same time, the composition of the entire bodies, the proportion and composition of the carcasses, and the proportions and compositions of the edible parts were practically alike.

The older pair of steers, viz: those fed for ten months longer time, contained a smaller proportion of water and a larger proportion of fat than the younger animals.

The older animals furnished five pounds per hundred more of water-free edible material than the younger animals. This is equivalent to a difference of twelve pounds of fresh, edible meat.

EXPERIMENTS WITH COWS.

An experiment in feeding wide and narrow rations to cows for milk production. Equal amounts of digestible matter were fed in each ration. The nutritive ratio of one ration was 1 : 12.3, the other 1 :6.7. *Results:* The general appearance of the cows was best when fed the nitrogenous ration and the yield of milk was 1-5 to 1-2 larger. The milk was some richer and the daily yield of milk solids was thirty to forty per cent larger on the nitrogenous rations than the milk ration.

Average daily yield milk solids on nitrogenous ration.	3.07 lbs.
Average daily yield milk solids on wide ration.......	2.28 lbs.

	Solids—%	Fat—%
Average composition of milk on nitrogenous ration	14.11	4.83
Average composition of milk on wide ration.....	13.54	4.34

AN EXPERIMENT TO TEST BREEDS OF DAIRY COWS.

The breeds tested were Holsteins, Ayrshires and Jerseys. The experiment continued two years. The following points were studied: (1.) Amount of food and nutrients. (2.) Yield of milk, solids, fat, cream and butter, and relations in quantity which these sustain; and (3.) The food cost of milk, milk solids, fat, cream and butter and incidentally the composition of the whole milk, skimmed milk, and butter milk from the different animals.

Results: (1.) The average amount of water-free food consumed daily for each animal was: Holstein, 27.4 pounds; Ayrshire, 24.7 pounds; Jersey, 28.3 pounds.

(2.) The annual yield of milk solids was: Holsteins, 1,014 pounds; Ayrshire, 848 pounds; Jersey, 827 pounds; and of butter fat, Holstein, 285 pounds; Ayrshire, 233 pounds, and Jersey, 297 pounds. Milk required for a pound of milk solids, Holstein, 8.3 pounds; Ayrshire, 7.8 pounds; Jersey, 6.6 pounds; for a pound of butter fat, Holstein, 29.4; Ayrshire, 28.3; Jersey, 18.2.

(3.) The cost of a quart of milk, reckoning the cattle foods at market prices was: Holstein, 1.83 cents; Ayrshire, 2.03 cents; Jersey, 2.42 cents. The food cost of a pound of milk solids was for Holstein, 7.09 cents; Ayrshire, 7.45 cents; Jersey, 7.44 cents; of a pound of butter fat, Holstein, 25.22 cents; Ayrshire, 26.62 cents; Jersey, 20.43 cents.

The average composition of the milk for the two years was:

	Solids—%	Fat—%
Holstein	12.22	3.47
Ayrshire	12.98	3.67
Jersey	15.24	5.50

The loss of fat in the skimmed milk was least for the Jerseys. Solids of skimmed milk were: Holstein, 9.50%; Ayrshire, 10.40%; Jersey, 10.50%.

AN EXPERIMENT TO COMPARE MAINE FIELD CORN SILAGE WITH SOUTHERN CORN SILAGE.

Results: The Maine field corn silage was found to have nearly ⅓ more digestible matter than the silage from the immature southern corn.

In the feeding trial, thirty pounds of the Maine field corn silage produced more flesh and milk than forty pounds of the southern corn silage.

AN EXPERIMENT TO COMPARE A LARGE RATION OF HAY WITH A MEDIUM RATION.

The rations consisted of (1) 13 pounds hay, 25 pounds silage, 7 pounds grain, (2) 8 pounds hay, 25 pounds silage, 7 pounds grain.

Results: The ration with the larger amount of hay proved the more efficient.

AN EXPERIMENT TO COMPARE THE FEEDING VALUE OF WHEAT MEAL WITH CORN MEAL.

Ration 1 consisted of hay, 18 pounds; wheat meal, 5 pounds; cottonseed meal, 2 pounds; and ration 2 of hay, 18 pounds; corn meal, 5 pounds; cottonseed meal, 2 pounds.

Result: The wheat meal in the combination was somewhat more efficient than the corn meal, and at about the same price can be economically substituted for it. The cows gained in weight on the wheat meal ration and produced slightly more milk than on the corn meal ration.

AN EXPERIMENT TO COMPARE GLUTEN MEAL WITH COTTON-SEED MEAL FOR MILCH COWS.

Results: The two foods proved to have equal efficiency when fed in amounts to furnish equal quantities of digestible matter.

AN EXPERIMENT TO COMPARE GROUND OATS WITH WHEAT BRAN AS FOOD FOR MILCH COWS.

Results: The ground oat ration produced slightly more milk, solids and fat than the bran, and when they can be purchased at about the same price make an excellent substitute for it.

AN EXPERIMENT TO SUBSTITUTE SILAGE FOR A PART OF THE GRAIN RATION OF MILCH COWS.

The silage used was the so-called Robertson mixture, consisting of matured corn (ears glazed), sun flower heads and horse beans. Six cows were used. The rations fed were: (1) Hay, 15 pounds; silage 20 pounds; grain, 8 pounds. (2) Hay, 15 pounds; silage, 35 pounds; grain, 4 pounds.

Results: Ration 2 in which silage was substituted for a part of the grain ration was fully equal to ration 1, producing as much milk and a greater gain in weight of cows.

AN EXPERIMENT IN FEEDING NUTRIOTONE.

This is a patent food or medicine, claimed by manufacturers to stimulate growth and milk production.

Five cows were fed three periods of twenty-one days each liberal rations of hay and grain. The rations were weighed. In the second feeding period, two spoonfuls of nutriotone (according to directions in the package) were added to the grain ration.

Results: The nutriotone had no visible effect. The cows in twenty-one days without nutritone produced 2,281 pounds milk and 101 pounds fat. The cows in twenty-one days with nutriotone produced 2,264 pounds milk and 101 pounds fat.

AN EXPERIMENT TO TEST THE EFFECT OF FOOD ON THE HARDNESS OF BUTTER AND COMPOSITION OF BUTTER FAT.

The primary object of the experiment was to study the effect of liberal rations of corn gluten meals containing large and small amounts of fat on the hardness of butter, and butter fat. Eight different gluten meals were used, varying in fat content from one per cent to nineteen per cent, also in other feeding trials gluten feed, flax meal, and cottonseed meal. Eleven cows were employed and twelve tests made. The feeding periods were from two to four weeks each and extended over three years. *Results:* The gluten meals with high fat content produced soft butter with fat of low melting point and high iodine number.

Gluten meals containing very small amounts of fat or oil, made butters of about normal firmness. When tallow was added to the ration, the hardness of the butter was somewhat increased. Cottonseed meal produced a hard butter. The hardness of butter can be regulated to a large extent by the food of the cows.

THE MINERAL INGREDIENTS OF MILK.

Analyses were made of the ash of the milk, from six cows, representing three breeds. *Results:* The differences in composition were great, even with cows of the same breed. The potash and phosphoric acid were the most variable constituents.

THE FAT GLOBULES OF MILK.

The milk of five cows, representing three breeds, was examined and the relative size and number of the globules determined, in both the whole and skimmed milk. *Results:* The globules of the milk from the Jersey cows were much larger than in the milk from the cows of the other breeds. In every case the globules of the skimmed milk were less than one-half the size of those from the whole milk.

EFFECTS OF TUBERCULIN ON TUBERCULOUS COWS.

The tests were applied to a herd of fourteen cows and cover periods of from one to two years. *Results:* The tests together with the autopsies indicate that tuberculin is a very delicate agent for determining the presence of tuberculosis. It is very doubtful if cows ever react under a properly made tuberculin test unless they have tuberculosis. On the other hand, it is very evident that cows sometimes have tuberculosis, or, at least, tuberculosis growths in their bodies, and yet fail to react under the tuberculin test.

A NEST BOX FOR KEEPING INDIVIDUAL EGG RECORDS.

An attempt is being made to establish families of hens that shall excel as egg producers. To do this it is necessary to make careful selections for which the individual records must serve as a basis. The nest box devised is believed to serve the purpose admirably.

THE NUMBER OF LAYING HENS THAT CAN BE PROFITABLY KEPT IN ONE PEN.

Varying numbers of hens were confined in pens having each 160 feet floor space. *Results:* The maximum production per hen was obtained when the least number of hens (15) was confined to one pen; but the pens containing twenty birds gave a greater total net profit than did those containing any greater or less number of birds.

EXPERIMENTS UPON THE DIGESTIBILITY OF BREAD WITH MEN WITH SPECIAL REFERENCE TO PROTEIN.

Results: Digestibility of protein of

White bread and milk	92.8%
Graham bread and milk	88.5%
Entire wheat bread and milk	91.9%

THE DIGESTIBILITY OF BREAD ALONE.

A continuation of the work outlined above. The approximate availability of the nutrients of butter, milk and sugar being known, a correction of the first results obtained was made possible.

Results: Digestibility of protein of

White bread alone	88.3%
Graham bread alone	77.0%
Entire wheat bread alone	86.6%

DIETARY STUDIES.

Investigations were carried on at the College Commons for a period of 209 days. *Results:* The cost of the animal foods was 69 per cent of the total food cost. The freer use of milk did not increase the gross weight of food eaten. The increased consumption of milk had the effect of materially narrowing the nutritive ratio of the dietary, while at the same time the cost of the dietary was diminished. Milk should not be regarded as a luxury, but as an economical article of diet.

SKIMMED MILK OR WATER IN BREAD MAKING.

An experiment designed to show the increased value of bread in which skimmed milk has been substituted for water. *Results:* Skimmed milk bread contains more protein than water bread and is as completely digested.

PUBLICATIONS OF THE STATION.

The Station has purchased 15 annual reports and 88 bulletins. The first 26 bulletins were newspaper bulletins published prior to the reorganization of the Station in 1888. All matter of permanent importance was included in the reports. The first number of the present series of bulletins was published May 1, 1889.

The titles of the principal papers in the reports and of the bulletins follow. The mark * preceding a report or bulletin denotes that the edition is nearly or quite exhausted. Copies of the publications not marked * will be sent on application so long as the numbers on hand will allow. The reports of this Station are bound with those of the Secretary of Agriculture, so that anyone having the "Agriculture of Maine" has also the report of the Station for that year.

*REPORT FOR 1885.

Inspection of fertilizers.

REPORT FOR 1886.

Inspection of fertilizers. Wood ashes. Harbor mud. Ashes vs. acid for treating ground bone. Purchase of fertilizing material. Manure residue of corn meal and cotton-seed meal. Composition of cattle foods and special foods. Digestion experiments with timothy hay and corn in various forms. Feeding cotton-seed meal for milk and butter production. Feeding steers for growth.

*REPORT FOR 1887.

Inspection of fertilizers. Miscellaneous fertilizers. Experiments with fertilizers at the Station and among farmers. Analyses of feeding stuffs. Digestion experiments. Feeding experiments for milk and butter and for growth. Inquiries concerning cattle foods. Tests and varieties, grain and potatoes. Experiments in raising cream. Adulteration of molasses. Insecticides. Analytical and experimental methods.

REPORT FOR 1888.

Inspection of fertilizers. Digestion experiments with sheep. The compounding of rations for farm animals. The composition and digestibility of American feeding stuffs. Tests of varieties of potatoes, oats, barley, and peas. Germination tests of seeds. Description of the following injurious insects: Round-headed apple-tree borer; Flat-headed apple-tree borer; Oyster-shell bark louse; Apple-tree tent-caterpillar; Forest tent-caterpillar; Fall canker-worm; Eye-spotted bud-moth; Apple-tree aphis; Codling moth; Apple maggot; Ash-gray pinion; Pear-tree slug; Indian cetonia; Plum curculio; Cherry-tree plant louse; Imported currant-worm; Ivy scale insect; Black swallow-tail butterfly; Eyed elater; Hawthorn tingis; Mourning cloak butterfly; Meal-worm beetle.

REPORT FOR 1889.

Inspection of fertilizers. Composition, digestibility and yield of corn-fodder and hay from various grasses. Composition and value of various commercial feeding stuffs. The comparative digestibility of wheat bran and wheat middlings. Composition and digestibility of pea meal. The value of the digestible matter of good hay as compared with the digestible matter of corn ensilage, for milk production. The value of the digestible matter of ensilage as compared with the digestible matter of hay, for growth. Feeding experiments with swine. Tests of several breeds of dairy cows. Field and pot experiments with fertilizers. Field tests with varieties of barley, oats and peas. Seed germination experiments. Experiments with forage plants. The potato rot. Apple scab. The apple maggot. Insecticides. Hog cholera. Parturient apoplexy, (milk fever). The coefficients of digestibility for protein. Loss of food and manurial value in selling sweet corn.

REPORT FOR 1890.

Inspection of fertilizers. Tests of dairy cows. Mechanical loss of butter fat. Effect of delay in setting milk. The mineral ingredients of milk. The fat globules of milk. Tuberculosis in the college herd. Feeding experiments with colts, steers, and swine. Field experiments with fertilizers. Germination tests of seeds. Spraying experiments. Injurious insects. Meteorological observations.

*REPORT FOR 1891.

Inspection of fertilizers. Station equipment. Digestion experiments. Production of food material by various fodder and root crops. Turnips for sheep. Producing growth in lambs. Feeding experiment with colts.

Influence of food on butter. Babcock milk test for cream. Equipment of horticultural department. Notes on cabbage, tomatoes and egg plants. Spraying for codling moth and apple scab. Spraying apparatus. Fertilizer experiments. Growing grains mixed and separately. Spring and fall manuring. Meteorological observations. Jamestown weed. White radish. Yellow dock. Chess. Mosses as stock food. Ticks. Sphinx moths. Cut worms. Cotton wood dagger. Three toothed Aphonus. Predaceous water beetle. Parallel elaphidion. Brown ptinus. Goldsmith beetle. Remedies for borers. Breeding statistics.

*REPORT FOR 1892.

Inspection of fertilizers. Miscellaneous analyses. Secondary effects of Pollination. Notes on cabbages, tomatoes and egg plant. Fruit tests. Spraying experiments. Fall dandelion. Orange hawkweed. Leaf blight of pear. Black or hair mold. Anthracnose of blackberry and raspberry. Potato blight. Fall canker worm. Boll or corn worm. Chinch bug. Horn fly. Two-spotted mite. Cut worms. Meteorological observations. Testing cream and milk fat test and lactometer.

REPORT FOR 1893.

Investigation of the foraging powers of some agricultural plants for phosphoric acid. The composition of fodders and silage from the corn plant. Digestion experiments with sheep. Corn as a silage crop. Feeding experiments with cows and swine. Waste of fat in the skimmed milk by the deep-setting process. Notes on cabbages, cauliflowers, tomatoes, egg plants and potatoes. Spraying experiments. Catalogue of Maine fruits. Bean and tomato anthracnose. Potato and beet scab. The Angoumois grain moth; the lime-tree winter-moth; the apple-leaf bucculatrix; the Disippus butterfly; the May beetle; the bean weevil; the pear-blight beetle or shot-borer; the carrot-fly.

REPORT FOR 1894.

Analyses of butter and imitation butter. Field experiments with fertilizers. The profitable amount of seed per acre for corn. Digestion experiments. Feeding experiments. Notes on potatoes and corn. Notes on small fruits and on plant breeding. The orange-colored roestelia or quince rust. Diseases of oats. Night-flowering catchfly. The dichotomous catchfly. Potato scab. The snow flea. The silver fish. The ring-banded soldier-bug. The elm tree bark louse. The gooseberry plant-louse. The oblique-banded carpet beetle. The oak-bark weevil. The fall canker worm. Tuberculin as a diagnostic agent. Bulletins issued in 1894—Fruit-culture. Spraying experiments. Tomatoes. Cauliflowers. Corn as a silage crop. Potatoes. Tuberculosis and glanders. A scheme for paying for cream, etc. Foraging powers of some agricultural plants.

REPORT FOR 1895.

Investigations on the foraging powers of some agricultural plants for phosphoric acid. The profitable amount of seed per acre for corn. Sunflower heads and blackeye peas as silage crops. Feeding experiments with milch cows. The relation of food to the growth and composition of the bodies of steers. Notes on potatoes, sweet corn, peas and cabbage. Notes on plants and insects. Second blooming of pear trees. Cattle lice. The yellow woolly bear. Tapestry moth. The strawberry leaf beetle. The cucumber flea beetle. The currant fly. Bulletins issued in 1895—Important facts about corn. Inspection of fertilizers. A discussion of certain commercial fertilizers. A discussion of condimental foods. Notes on small fruits. Inspection of fertilizers.

REPORT FOR 1896.

New fittings of the cow stable. Analyses of feeding stuffs. Profitable amount of seed corn per acre. Sunflowers and English horse beans as silage crops. Tests of separators. Feeding experiments with milch cows. Effects of tuberculin on tuberculous cows. Orchard notes. Notes on winter gardening. Notes on plants. Insects of the year. A new garden Smynthurid. Dietary studies at the Maine State College. Meteorological summary. Reprints of bulletins 23 to 31. Inspection laws. General index to reports for 1885 to 1895 inclusive.

REPORT FOR 1897.

Reprints of bulletins 32 to 40. Inspections for 1897. Testing dairy products by the Babcock test. New poultry plant. Ornamenting home grounds. Acquisition of atmospheric nitrogen. Digestion experiments. Tests of tuberculin on tuberculous cows. Comparison of the temperatures of healthy and tuberculous cows. Notes on insects and plants. King-devil weed. Herd records. Meteorological observations.

REPORT FOR 1898.

Reprint of bulletins 41 to 47. Inspections for 1898. Box experiments with phosphoric acid. Analyses of fodders and feeding stuffs. Digestion experiments with sheep. Oat hay harvested at different stages of maturity. Effect of food on the hardness of butter and composition of butter fat. Effect of feeding fat on the fat content of milk. Injurious millipedes. An injurious caddice fly. Insects and plants of the year. Tuberculosis and the station herd. Nest box for keeping individual egg records. Number of laying hens that can be profitably kept in one pen. Herd records. Comparison of large and small radish seed. Effects of subwatering radishes. Blueberry in Maine. Experiments upon the digestibility of bread. Acquisition of atmospheric nitrogen. Soil inoculation. Skimmed milk vs. water in bread making. Pollination and fertilization of flowers. Meteorological observations.

NUMBERS AND TITLES OF BULLETINS OF THE PRESENT SERIES.

1. Analysis of Commercial Fertilizers for 1889.
2. The Apple Maggot.
*3. Babcock Milk Test Adapted to Testing Cream.
4. Testing Cream and Milk Fat Test and Lactometer.
5. Waste of Fat in Skimmed Milk by the Deep-setting Process.
6. Fruit Culture—Varieties.
7. Inspection of Fertilizer.
8. Spraying Experiments.
9. Tomatoes.
10. Cauliflowers.
11. Corn as a Silage Crop.
12. Potatoes.
13. Suppression of Bovine Tuberculosis and Glanders.
14. Inspection of Fertilizers.
*15. Paying for Cream by the Babcock Test.
16. Foraging Powers of Some Agricultural Plants for Phosphoric Acid.
17. Important Facts about Corn.
18. Inspection of Fertilizers, 1895.
19. Commercial Articles (1) Fertilizers.
20. Commercial Articles (2) Foods.
21. Notes on Small Fruits.
22. Inspection of Fertilizers.
23. Preservation of Cream for Market.
24. Cabbages.
25. Inspection of Fertilizers, 1896.
26. Inspection of Glassware used by Creameries and Butter Factories.
27. Peas—Sweet Corn.
28. Potato Rot—Bordeaux Mixture and Fungiroid.
29. Notes on Spraying.
30. Fertilizer Inspection.
*31. Modification of Babcock Method.
32. Three Troublesome Weeds.
33. Fertilizer Inspection.
*34. Box Experiments with Phosphates.
35. The Currant Fly.
36. Testing Seeds.
37. Feeding Stuff Inspection.
38. Fertilizer Inspection.
39. Stock Feeding Suggestions.
40. Celery.
41. Dehorning Cows.
*42. Ornamenting Home Grounds.
43. Fertilizer Inspection.
44. Feeding Stuff Inspection.
45. Fertilizer Inspection.
46. Ornamental Plants for Maine.

47. Wheat Offals Sold in Maine in 1898.
48. Feeding Stuff Inspection.
49. Care of Orchards.
50. Fertilizer Inspection.
51. Feeding Stuff Inspection.
52. The Spraying of Plants.
53. Fertilizer Inspection.
54. Nuts as Food.
55. Cereal Breakfast Foods.
56. Apple Insects of Maine.
57. Experiments With Potatoes.
58. Finances, Meteorology, Index.
59. Feeding Stuff Inspection.
60. Fertilizer Inspection.
61. Notes on Insects and Plants.

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FEEDING STUFF INSPECTION.

CHAS. D. WOODS, Director.

J. M. BARTLETT, chemist in charge of inspection analyses.

CHIEF REQUIREMENTS OF THE LAW.

The points of the law of most interest to dealer and consumer are:

Kinds of Feed coming within the Law. The law applies to *all feeding stuffs except* hays and straws; whole seeds and meals of wheat, rye, barley, oats, Indian corn, buckwheat and broom corn; wheat, buckwheat and rye brans or middlings *not mixed with other substances*, but sold separately, as distinct articles of commerce.*

Inspection tax and tag. To meet the expenses of inspection, a tax of ten cents per ton must be paid to the Director of the Maine Agricultural Experiment Station who is required to furnish a tag stating that all charges have been paid. This tag, which bears the Director's signature, shows that the tax has been paid but is *not a guarantee of the quality of the goods.*

The brand. Each package of feeding stuff included within the law shall have affixed the inspection tax tag and shall also bear, conspicuously printed; the number of net pounds contained in the package, the name or trade mark under which it is sold, the name of the manufacturer or shipper, the place of manufacture, the place of business or manufacture or shipper, the percentage of crude protein, the percentage of crude fat. These statements may be printed directly on the bag, on a tag attached to the package, or on the back of the inspection tax tag furnished by the Director of the Station. The quality of the goods is guaranteed by the manufacturer, importer or dealer, *and not by the Station.* The samples collected and analyzed by the Station show whether the goods are up to guarantee or not.

The goods must carry the inspection tax tag and the brand before they can be legally offered for sale in the State. It will not answer to affix tags at the time the goods are sold.

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*All milling offals except bran or middlings come under the requirement of the law. See page 88 of this Bulletin.

MANUFACTURERS AND PLACE OF SAMPLING.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8848	Chapin & Co	St. Louis, Mo	Rumford Falls
8874	Chapin & Co	St. Louis, Mo	Bangor
8881	Chapin & Co	St. Louis, Mo	Bangor
8893	Chapin & Co	St. Louis, Mo	Bangor
8906	Chapin & Co	St. Louis, Mo	Portland
8907	Chapin & Co	St. Louis, Mo	Portland
8908	Chapin & Co	St. Louis, Mo	Saco
8909	Chapin & Co	St. Louis, Mo	Yarmouth
8910	Chapin & Co	St. Louis, Mo	Westbrook
8944	Chapin & Co	St. Louis, Mo	Brunswick
8945	Chapin & Co	St. Louis, Mo	Freeport
8979	Chapin & Co	St. Louis, Mo	Auburn
8980	Chapin & Co	St. Louis, Mo	Lewiston
8981	Chapin & Co	St. Louis, Mo	Augusta
8982	Chapin & Co	St. Louis, Mo	Richmond
8983	Chapin & Co	St. Louis, Mo	Pittsfield
8937	The American Cotton Oil Co	Memphis, Tenn*	Camden
8940	The American Cotton Oil Co	Memphis, Tenn*	Fryeburg
8939	The American Cotton Oil Co	Little Rock, Ark	Brunswick
8938	The American Cotton Oil Co	Jackson, Tenn	Hiram
9042	The American Cotton Oil Co	Jackson, Tenn	Corinna
8901	F. W. Brodé & Co	Memphis, Tenn	Stroudwater
8994	F. W. Brodé & Co	Memphis, Tenn	Auburn
8995	F. W. Brodé & Co	Memphis, Tenn	Pittsfield
9041	F. W. Brodé & Co	Memphis, Tenn	Foxcroft
8900	E. B. Williams & Co	Memphis, Tenn	Portland
8941	E. B. Williams & Co	Memphis, Tenn	Bridgton
8942	E. B. Williams & Co	Memphis, Tenn	Fryeburg
8943	E. B. Williams & Co	Memphis, Tenn	Brownfield
8988	E. B. Williams & Co	Memphis, Tenn	Bowdoinham
8989	E. B. Williams & Co	Memphis, Tenn	Lewiston
8990	E. B. Williams & Co	Memphis, Tenn	South Paris
8991	E. B. Williams & Co	Memphis, Tenn	Newport
8992	E. B. Williams & Co	Memphis, Tenn	Norway
9038	E. B. Williams & Co	Memphis, Tenn	Skowhegan
9039	E. B. Williams & Co	Memphis, Tenn	Hampden
8866	S. A. & J. H. True Co		Boothbay
8872	S. A. & J. H. True Co		Portland
8880	S. A. & J. H. True Co		Portland
8902	S. A. & J. H. True Co		Portland
8899	The Southern Cotton Oil Co		Biddeford
8978	The Southern Cotton Oil Co		Augusta
8917	Butler Breed Co		Saco
8946	Paris Flouring Co	Memphis, Tenn	Freeport
8947	Humphreys, Goodwin & Co	Memphis, Tenn	South Windham
8993	Humphreys, Goodwin & Co	Memphis, Tenn	Auburn
8984	J. E. Soper & Co		Lewiston
8985	J. E. Soper & Co		Bowdoinham

* Hanover Mill.

ANALYSES OF SAMPLES.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Cotton Seed Meal	46.50	43.00	*	9.00	8848
Cotton Seed Meal	45.38	43.00	8.95	9.00	8874
Cotton Seed Meal	45.50	43.00	9.21	9.00	8881
Cotton Seed Meal	43.56	43.00	12.12	9.00	8893
Cotton Seed Meal	45.69	43.00	9.77	9.00	8906
Cotton Seed Meal	41.69	43.00	16.52	9.00	8907
Cotton Seed Meal	43.06	43.00	12.40	9.00	8908
Cotton Seed Meal	43.94	43.00	12.26	9.00	8909
Cotton Seed Meal	42.56	43.00	14.53	9.00	8910
Cotton Seed Meal	45.50	43.00	9.84	9.00	8944
Cotton Seed Meal	44.50	43.00	11.74	9.00	8945
Cotton Seed Meal	47.63	43.00	10.69	9.00	8979
Cotton Seed Meal	46.94	43.00	10.14	9.00	8980
Cotton Seed Meal	47.38	43.00	10.06	9.00	8981
Cotton Seed Meal	43.81	43.00	12.21	9.00	8982
Cotton Seed Meal	47.75	43.00	9.32	9.00	8983
Prime Cotton Seed Meal	45.31	43.00	12.03	9.00	8937
Prime Cotton Seed Meal	43.44	45.00	10.60	9.00	8940
Prime Cotton Seed Meal	43.38	43.00	9.80	9.00	8939
Prime Cotton Seed Meal	47.25	43.60	8.48	9.00	8938
Prime Cotton Seed Meal	47.63	43.00	9.17	9.00	9042
Owl Brand Pure Cotton Seed Meal	46.19	43.00	14.34	9.00	8901
Owl Brand Pure Cotton Seed Meal	48.94	43.00	10.99	9.00	8994
Owl Brand Pure Cotton Seed Meal	47.81	43.00	9.04	9.00	8995
Owl Brand Pure Cotton Seed Meal	49.13	43.00	11.13	9.00	9041
Daisy Brand Cotton Seed Meal	46.00	43.00	12.11	9.00	8900
Daisy Brand Cotton Seed Meal	46.69	43.00	8.34	9.00	8941
Daisy Brand Cotton Seed Meal	44.19	43.00	8.68	9.00	8942
Daisy Brand Cotton Seed Meal	47.31	43.00	9.11	9.00	8943
Daisy Brand Cotton Seed Meal	45.44	43.00	12.17	9.00	8988
Daisy Brand Cotton Seed Meal	45.75	43.00	8.68	9.00	8989
Daisy Brand Cotton Seed Meal	47.38	43.00	8.75	9.00	8990
Daisy Brand Cotton Seed Meal	46.75	43.00	8.39	9.00	8991
Daisy Brand Cotton Seed Meal	47.69	43.00	9.71	9.00	8992
Daisy Brand Cotton Seed Meal	44.44	43.00	12.57	9.00	9038
Daisy Brand Cotton Seed Meal	44.56	43.00	8.21	9.00	9039
Prime Cotton Seed Meal	23.50	43.00	8.11	9.00	8866
Prime Cotton Seed Meal	24.25	43.00	8.03	9.00	8872
Prime Cotton Seed Meal	25.63	43.00	7.54	9.00	8880
Prime Cotton Seed Meal	22.19	43.00	7.14	9.00	8902
Prime Finely Ground Cotton Seed Meal	47.25	43.00	9.28	9.00	8899
Prime Finely Ground Cotton Seed Meal	46.19	43.00	10.17	9.00	8978
Cotton Seed Meal	45.50	43.00	11.30	9.00	8917
Prime Memphis Cotton Seed Meal	45.38	43.00	10.12	9.00	8946
Dixie Brand Cotton Seed Meal	44.75	43.00	8.33	9.00	8947
Dixie Brand Cotton Seed Meal	44.13	43.00	9.67	9.00	8993
Cotton Seed Meal	44.25	43.00	9.14	9.60	8984
Cotton Seed Meal	44.13	43.00	12.72	9.00	8985

*Not determined.

MANUFACTURERS—Continued.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8986	J. E. Soper & Co		Norway
8987	J. E. Soper & Co		Richmond
9040	J. E. Soper & Co		Winterport
8904	J. E. Soper & Co		Saco
8905	J. E. Soper & Co		Portland
8850			Palmyra
8996			Pittsfield
8871	S. W. Hamilton		Cumberland Junc.
8903	Matthews & Houston		Portland
8916	S. A. & J. H. True Co		Biddeford
8856	The Glucose Sugar Refining Co.		Pittsfield
8857	The Glucose Sugar Refining Co.		Portland
8861	The Glucose Sugar Refining Co.		Portland
8862	The Glucose Sugar Refining Co.		Portland
8875	The Glucose Sugar Refining Co.		Bangor
8876	The Glucose Sugar Refining Co.		South Brewer
8882	The Glucose Sugar Refining Co.		Bangor
8883	The Glucose Sugar Refining Co.		Bangor
8884	The Glucose Sugar Refining Co.		Bangor
8914	The Glucose Sugar Refining Co.		Biddeford
8948	The Glucose Sugar Refining Co.		Hiram
8949	The Glucose Sugar Refining Co.		Rockland
8950	The Glucose Sugar Refining Co.		Camden
8951	The Glucose Sugar Refining Co.		Bridgton
8952	The Glucose Sugar Refining Co.		Brownfield.
9000	The Glucose Sugar Refining Co.		Auburn
9002	The Glucose Sugar Refining Co.		Auburn
9045	The Glucose Sugar Refining Co.		Winterport
8913	The Glucose Sugar Refining Co.		Saco
8892	The Glucose Sugar Refining Co.		Oldtown
8998	The Glucose Sugar Refining Co.		Pittsfield
8999	The Glucose Sugar Refining Co.		Lewiston
8997	The Glucose Sugar Refining Co.		Augusta
9001	The Glucose Sugar Refining Co.		Auburn
8911	Charles Pope Glucose Co		Saco
8912	Charles Pope Glucose Co		Stroudwater
8953	Charles Pope Glucose Co		Bath
8954	Charles Pope Glucose Co		Brunswick
9003	Charles Pope Glucose Co		Auburn
9004	Charles Pope Glucose Co		Lewiston
8915	National Starch Manf'g Co	Des Moines, Iowa	Portland
8955	National Starch Manf'g Co	Des Moines, Iowa	Freeport
8956	National Starch Manf'g Co	Des Moines, Iowa	South Windham
9005	National Starch Manf'g Co	Des Moines, Iowa	Richmond
9006	National Starch Manf'g Co	Des Moines, Iowa	Auburn
9007	National Starch Manf'g Co	Des Moines, Iowa	Norway
9008	National Starch Manf'g Co	Des Moines, Iowa	Lewiston
9009	National Starch Manf'g Co	Des Moines, Iowa	Monmouth

ANALYSES—Continued.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Cotton Seed Meal	44.13	43.00	10.32	9.00	8986
Cotton Seed Meal	42.50	43.00	8.69	9.00	8987
Cotton Seed Meal	44.50	43.00	10.64	9.00	9040
Cotton Seed Meal	45.19	43.00	9.80	9.00	8904
Cotton Seed Meal	44.50	43.00	9.03	9.00	8905
Cotton Seed Meal	45.44	No guar.	14.05	No guar.	8850
Cotton Seed Meal	45.06	No guar.	12.37	No guar.	8996
Cotton Seed Meal	27.13	No guar.	*	No guar.	8871
Sea Island Cotton Seed Meal	25.44	No guar.	6.91	No guar.	8903
Cotton Seed Meal	23.63	No guar.	7.99	No guar.	8916
Chicago Gluten Meal	34.19	38.00	3.87	2.00	8856
Chicago Gluten Meal	38.56	38.00	3.44	2.00	8857
Chicago Gluten Meal	39.38	38.00	3.05	2.00	8861
Chicago Gluten Meal	39.56	38.00	2.68	2.00	8862
Chicago Gluten Meal	34.50	38.00	4.61	2.00	8875
Chicago Gluten Meal	33.25	38.00	4.33	2.00	8876
Chicago Gluten Meal	35.38	38.00	4.48	2.00	8882
Chicago Gluten Meal	33.38	38.00	3.88	2.00	8883
Chicago Gluten Meal	35.81	38.00	4.16	2.00	8884
Chicago Gluten Meal	39.13	38.00	2.58	2.00	8914
Chicago Gluten Meal	34.25	38.00	4.49	2.00	8948
Chicago Gluten Meal	39.75	38.00	3.32	2.00	8949
Chicago Gluten Meal	34.25	38.00	4.61	2.00	8950
Chicago Gluten Meal	33.63	38.00	4.83	2.00	8951
Chicago Gluten Meal	34.13	38.00	3.73	2.00	8952
Chicago Gluten Meal	33.88	38.00	4.51	2.00	9000
Chicago Gluten Meal	34.88	38.00	3.38	2.00	9002
Chicago Gluten Meal	38.31	38.00	3.04	2.00	9045
Chicago Gluten Meal	32.94	38.00	4.14	2.00	8913
Chicago Gluten Meal	33.19	34.20	3.58	3.75	8892
Chicago Gluten Meal	34.06	34.20	3.61	3.75	8998
Chicago Gluten Meal	38.00	34.20	3.74	3.75	8999
Chicago Gluten Meal	36.88	36.00	2.88	3.37	8997
Chicago Gluten Mea	36.31	36.00	4.36	3.37	9001
Cream Gluten Meal	32.63	34.12	3.29	3.20	8911
Cream Gluten Meal	34.19	34.12	2.57	3.20	8912
Cream Gluten Meal	33.00	34.12	1.37	3.20	8953
Cream Gluten Meal	32.13	34.12	1.64	3.20	8954
Cream Gluten Meal	32.13	34.12	1.13	3.20	9003
Cream Gluten Meal	32.69	34.12	2.58	3.20	9004
King Gluten Meal	31.06	32.00	12.39	16.00	8915
KingGluten Meal	31.50	32.00	10.73	16.00	8955
King Gluten Meal	35.69	32.00	2.04	16.00	8956
King Gluten Meal	30.44	32.00	3.13	16.00	9005
King Glutun Meal	33.94	32.00	2.37	16.00	9006
King Gluten Meal	36.50	32.00	2.31	16.00	9007
King Gluten Meal	38.44	32.00	2.86	16.00	9008
King Gluten Meal	34.94	32.00	3.22	16.00	9009

* Not determined.

MANUFACTURERS—Continued.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
9044	National Starch Manf'g Co	Des Moines, Iowa	Corinna
8851	The Glucose Sugar Refining Co.	Rockford, Ill	Bangor
8852	C. B. Cummings & Son		Norway
8849	Manger L. O. Co	Toledo, Ohio	Orono
8930	S. A. & J. H. True Co		Portland
8960	S. A. & J. H. True Co		Bridgton
8958	Mayflower Mills	Fort Wayne, Ind	Bath
8959	American Linseed Co	South Chicago, Ill	Fryeburg
8957	The Cleveland Linseed Oil Co		Rockland
9013	The Cleveland Linseed Oil Co		Winthrop
9014	The Cleveland Linseed Oil Co		Norway
9015	The Cleveland Linseed Oil Co		Lewiston
9010	Not named		Newport
9011	Not named		Monmouth
9043	Not named		Skowhegan
9012	Not named		Auburn
8885	The American Cereal Co	Chicago, Ill	Bangor
8918	The American Cereal Co	Chicago, Ill	Portland
8919	The American Cereal Co	Chicago, Ill	Portland
8920	The American Cereal Co	Chicago, Ill	Saco
8961	The American Cereal Co	Chicago, Ill	Fryeburg
8962	The American Cereal Co	Chicago, Ill	South Windham
9018	The American Cereal Co	Chicago, Ill	Richmond
9019	The American Cereal Co	Chicago, Ill	Bethel
9020	The American Cereal Co	Chicago, Ill	Lewiston
9046	The American Cereal Co	Chicago, Ill	Skowhegan
9047	The American Cereal Co	Chicago, Ill	Belfast
8891	The H-O Co	Buffalo, N. Y	Oldtown
8925	Dock & Coal Co	Plattsburgh, N. Y	Portland
8926	S. A. & J. H. True Co		Portland
8894	Not named		Oldtown
8922	The American Cereal Co	Chicago, Ill	Portland
8974	The American Cereal Co	Chicago, Ill	Readfield Depot
8924	W. H. Haskell & Co	Toledo, Ohio	Portland
8869	The H-O Co	Buffalo, N. Y	Greenville
8921	The American Cereal Co	Chicago, Ill	Westbrook
8963	The American Cereal Co	Chicago, Ill	Brunswick
8964	The American Cereal Co	Chicago, Ill	South Windham
8965	The American Cereal Co	Chicago, Ill	Brownfield
9021	The American Cereal Co	Chicago, Ill	Richmond
9048	The American Cereal Co	Chicago, Ill	Waterville
8890	The American Cereal Co	Chicago, Ill	Bangor
8923	The American Cereal Co	Chicago, Ill	Yarmouth
8928	Not named		Yarmouth
8847	Not named		Rumford Falls
8870	Not named		Orono
8887	Not named		Bangor
8888	Not named		Bucksport

ANALYSES—Continued.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
King Gluten Meal	37.06	32.00	2.85	16.00	9044
Diamond Gluten Feed	26.25	26.20	2.47	2.70	8851
Gluten Feed	27.19	26.00	4.13	4.00	8852
Linseed Oil Meal	35.38	39.00	7.56	1.50	8849
Linseed Oil Meal	29.94	30.00	6.94	7.00	8930
Linseed Oil Meal	32.56	36.94	6.15	6.58	8960
Old Process Oil Meal	18.88	19.00	6.95	7.00	8958
Linseed Meal	38.69	38.00	2.90	3.00	8959
Cleveland Flax Meal	38.50	39.00	2.68	1.50	8957
Cleveland Linseed Oil Meal	36.75	39.00	2.87	1.50	9013
Cleveland Linseed Oil Meal	39.69	39.00	2.23	1.50	9014
Cleveland Linseed Oil Meal	36.88	39.00	2.59	1.50	9015
Linseed Oil Meal	37.69	38.00	2.63	1.00	9010
Linseed Oil Meal	37.56	38.00	2.57	1.00	9011
Linseed Oil Meal	37.50	38.00	2.71	1.00	9043
Linseed Oil Meal	39.00	No guar.	2.83	No guar.	9012
Victor Corn and Oat Feed	8.19	9.46	3.28	3.92	8885
Victor Corn and Oat Feed	8.19	9.46	3.14	3.42	8918
Victor Corn and Oat Feed	9.19	9.46	4.67	3.42	8919
Victor Corn and Oat Feed	8.44	9.46	4.03	3.42	8920
Victor Corn and Oat Feed	9.44	9.46	3.42	3.92	8961
Victor Corn and Oat Feed	8.50	8.23	3.10	3.00	8962
Victor Corn and Oat Feed	9.19	8.23	4.07	3.00	9018
Victor Corn and Oat Feed	8.88	8.23	3.43	3.00	9019
Victor Corn and Oat Feed	8.13	9.46	3.08	3.92	9020
Victor Corn and Oat Feed	9.75	9.46	4.60	3.92	9046
Victor Corn and Oat Feed	9.25	8.23	4.20	3.00	9047
H-O Co.'s Dundee Corn and Oat Feed	8.13	8.38	2.70	2.95	8891
Dandy Corn and Oat Feed	9.13	No guar.	4.77	No guar.	8925
Corn and Oat Feed	7.50	9.63	3.27	4.23	8926
Oat Chop	9.13	8.00	4.55	5.00	8894
Quaker Oat Feed	13.38	12.03	3.11	3.49	8922
Quaker Oat Feed	10.06	12.03	2.68	3.49	8974
Oat Feed	9.50	9.62	4.82	7.60	8924
The H-O Co.'s Dairy Feed	16.63	18.00	4.82	4.50	8869
Quaker Dairy Feed	14.36	12.03	3.67	3.49	8921
Quaker Dairy Feed	14.00	12.03	3.09	2.50	8963
Quaker Dairy Feed	14.38	12.03	2.79	2.50	8964
Quaker Dairy Feed	13.00	12.03	2.91	3.49	8965
Quaker Dairy Feed	13.31	12.03	3.34	3.49	9021
Quaker Dairy Feed	14.50	12.03	4.12	2.50	9048
American Poultry Food	12.69	No guar.	5.52	No guar.	8890
American Poultry Food	13.69	13.96	6.22	5.49	8923
Rice Feed	8.75	No guar.	9.03	No guar.	8928
Purity Mixed Feed	11.50	No guar.	*	No guar.	8847
Purity Mixed Feed	10.63	No guar.	*	No guar.	8870
Purity Mixed Feed	12.88	No guar.	4.42	No guar.	8887
Purity Mixed Feed	10.56	No guar.	3.80	No guar.	8888

*Not determined.

MANUFACTURERS—Concluded.

Station number.	Manufacturer or Jobber.	Manufactured at	Sampled at
8927	Not named		Portland
8936	Not named		Winthrop
8969	Not named		Brunswick
8970	Not named		Brunswick
8973	Not named		Readfield Depot
9023	Not named		Newport
9024	Not named		Winthrop
9025	Not named		Lewiston
9049	Not named		Foxcroft
8877	The Doten Grain Co		South Brewer
8878	The Doten Grain Co		Bangor
8929	The Doten Grain Co.		Biddeford
8966	The Doten Grain Co		Hiram
8967	The Doten Grain Co		South Windham
8968	The Doten Grain Co		Freeport
8886	Not named		Bangor
8971	Not named		Fryeburg
9027	Not named		Norway
9028	Not named		Bethel
9026	Not named		South Paris
8889	The Bowker Co	Boston, Mass	Bangor
8932	The Bowker Co	Boston, Mass	Portland
8933	The Bowker Co	Boston, Mass	Portland
9016	The Bowker Co	Boston, Mass	Norway
8931	Bradley Fertilizer Co	Boston, Mass	Portland
8934	N. W. Fertilizer Co	Chicago, Ill	Portland
8935	The Armour Fertilizer Works.	Chicago, Ill	Portland
9017	Sagadahoc Fertilizer Co	Bowdoinham	Bowdoinham

ANALYSES—Concluded.

Name of Feed.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Purity Mixed Feed	10.88	No guar.	3.51	No guar.	8927
Purity Mixed Feed	11.13	No guar.	3.62	No guar.	8936
Purity Mixed Feed	12.63	No guar.	4.15	No guar.	8969
Purity Mixed Feed	12.25	No guar.	4.16	No guar.	8970
Purity Mixed Feed	12.19	No guar.	3.14	No guar.	8973
Purity Mixed Feed	12.63	No guar.	3.93	No guar.	9023
Purity Mixed Feed	12.63	No guar.	4.14	No guar.	9024
Purity Mixed Feed	12.75	No guar.	3.98	No guar.	9025
Purity Mixed Feed	12.13	No guar.	4.45	No guar.	9049
Crown Fancy Winter Wh't Mixed Feed	12.13	No guar.	4.48	No guar.	8877
Crown Fancy Winter Wh't Mixed Feed	12.25	No guar.	3.81	No guar.	8878
Crown Fancy Winter Wh't Mixed Feed	12.19	No guar.	4.19	No gaur.	8929
Crown Fancy Winter Wh't Mixed Feed	12.00	No guar.	3.22	No guar	8966
Crown Fancy Winter Wh't Mixed Feed	12.06	No guar.	4.02	No guar.	8967
Crown Fancy Winter Wh't Mixed Feed	11.44	No guar.	3.98	No guar.	8968
Kentucky Mixed Feed	9.13	11.00	4.28	No guar.	8886
Kentucky Mixed Feed	13.50	No guar.	4.08	No guar.	8971
Kentucky Mixed Feed	11.88	No guar.	3.25	No guar.	9027
Kentucky Mixed Feed	13.00	No guar.	3.58	No guar.	9028
Mixed Feed	12.50	No guar.	3.52	No guar.	9026
Bowker's Animal Meal	39.75	30.00	10.63	5.00	8889
Bowker's Animal Meal	47.63	30.00	9.10	5.00	8932
Bowker's Beef Scraps	48.56	30.00	16.95	20.00	8933
Bowker's Ground Beef Scraps	56.00	60.00	18.94	14.00	9016
Bradley's Superior Meat Meal	48.75	40.00	9.93	15.00	8931
Horse Shoe Brand Gr'd Beef Cracklings	64.63	60.00	18.26	16.00	8934
Meat Meal for Poultry	58.88	60.00	17.60	16.00	8935
Raw Ground Bone Meal	27.94	18.75	2.44	No guar.	9017

SUMMARY OF ANALYSES.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
Chapin & Co.'s		Highest	47.75	....	16.52	
Cotton Seed Meal.	16	Lowest	41.69	43.00	8.95	9.00
		Average	45.09	....	11.32	
The American Cotton Oil Co.'s		Highest	47.63	....	12.03	
Prime Cotton Seed Meal.	5	Lowest	43.38	43.00	8.48	9.00
		Average	45.40	....	10.02	
F. W. Brodé & Co.'s		Highest	49.13	....	14.34	
Owl Brand Pure Cotton Seed	4	Lowest	46.19	43.00	9.04	9.00
Meal.		Average	48.02	....	11.37	
E. B. Williams & Co.'s		Highest	47.69	....	12.57	
Daisy Brand Cotton Seed	11	Lowest	44.19	43.00	8.21	9.00
Meal.		Average	46.11	....	9.71	
The Southern Cotton Oil Co.'s		Highest	47.25	....	10.17	
Prime Finely Ground Cotton	2	Lowest	46.19	43.00	9.28	9.00
Seed Meal.		Average	46.72	....	9.73	
Butler Breed Co.'s						
Cotton Seed Meal.	1	....	45.50	43.00	11.30	9.00
Paris Flouring Co.'s						
Prime Memphis Cotton Seed	1	....	45.38	43.00	10.12	9.00
Meal.						
Humphreys, Goodwin & Co.'s		Highest	44.75	....	9.67	
Dixie Brand Cotton Seed	2	Lowest	44.13	43.00	8.33	9.00
Meal.		Average	44.44	....	9.00	
J. E. Soper & Co.'s		Highest	45.19	....	12.72	
Cotton Seed Meal.	7	Lowest	42.50	43.00	8.69	9.00
		Average	44.17	....	10.05	
Manufacturer unknown		Highest	45.44	....	14.05	
Cotton Seed Meal.	2	Lowest	45.06	....	12.37	
		Average	45.25	....	13.21	
S. A. & J. H. True Co.'s		Highest	25.63	....	8.11	
Prime Cotton Seed Meal.	4	Lowest	22.19	43.00	7.14	9.00
		Average	23.89	....	7.71	
Manufacturer unknown		Highest	27.13	....	7.99	
Cotton Seed Meal.	3	Lowest	25.63	....	6.91	
		Average	25.40	....	7.45	
The Glucose Sugar Refin'g Co.'s		Highest	39.75	38.00	4.83	3.75
Chicago Gluten Meal.	24	Lowest	32.94	34.2	2.58	2.00
		Average	35.73	....	3.80	
Chas. Pope Glucose Co.'s		Highest	34.19	....	3.29	
Cream Gluten Meal.	6	Lowest	32.13	34.12	1.13	3.20
		Average	32.78	....	2.10	
National Starch Manf'g Co.'s		Highest	38.44	....	12.39	
King Gluten Meal.	9	Lowest	30.44	32.00	2.04	16.00
		Average	34.46	....	4.65	

SUMMARY OF ANALYSES—Continued.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
The Glucose Sugar Refin'g Co.'s Diamond Gluten Feed.	1	....	26.25	26.20	2.47	2.70
C. B. Cummins & Son's Gluten Feed.	1	....	27.19	26.00	4.13	4.00
Manger L. O. Co.'s Linseed Oil Meal.	1	....	35.38	39.00	7.65	1.50
S. A. & J. H. True Co.'s Linseed Oil Meal.	1	....	29.94	30.00	6.94	7.00
S. A. & J. H. True Co.'s Linseed Oil Meal.	1	....	32.56	36.94	6.15	6.58
Mayflower Mills' Oil Process Oil Meal.	1	....	18.88	19.00	6.95	7.00
The American Linseed Co.'s Linseed Meal.	1	....	38.69	38.00	2.90	3.00
The Cleveland Linseed Oil Co.'s Cleveland Flax Meal.	1		38.50	39.00	2.68	1.50
Cleveland Linseed Oil Co.'s Cleveland Linseed Oil Meal.	3	Highest Lowest Average	39.69 36.75 37.77	.... 39.00	2.87 2.23 2.56	1.50
Manufacturer Unknown Linseed Oil Meal.	3	Highest Lowest Average	37.69 37.50 37.58	.... 38.00	2.71 2.57 2.64	1.00
Manufacturer Unknown Unguaranteed Linseed Oil Meal.	1	....	39.00	....	2.83	
The American Cereal Co.'s Victor Corn and Oat Feed.	11	Highest Lowest Average	9.75 8.13 8.83	9.46 8.23	4.67 3.08 3.73	3.92 3.00
The H-O Co.'s Dundee Corn and Oat Feed.	1	....	8.13	8.38	2.70	2.95
Dock & Coal Co.'s Dandy Corn and Oat Feed.	1	....	9.13	....	4.77	
S. A. & J. H. True Co.'s Corn and Oat Feed.	1	....	7.50	9.63	3.27	.23
Manufacturer Unknown Oat Crop.	1	....	9.13	8.00	4.55	5.00
The American Cereal Co.'s Quaker Oat Feed.	2	Highest Lowest Average	13.38 10.06 11.72	.... 12.03	3.11 2.68 2.89	3.49
W. H. Haskell & Co.'s Oat Feed.	1	....	9.50	9.62	4.82	7.60
The H-O Co.'s Dairy Feed.	1	....	16.63	18.00	4.82	4.50

SUMMARY OF ANALYSES—Concluded.

	Number of analyses.		Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.
The American Cereal Co.'s Quaker Dairy Feed.	6	Highest	14.50	....	4.12	3.49
		Lowest	13.00	12.03	2.79	2.50
		Average	13.92	....	3.32	
The American Cereal Co.'s American Poultry Food.	2	Highest	13.69	....	6.22	
		Lowest	12.69	13.96	5.52	5.49
		Average	13.19	. ...	5.87	
Manufacturer Unknown Rice Feed.	1	... .	8.75	....	9.03	
Manufacturer Unknown Purity Mixed Feed. .	13	Highest	12.75	....	4.45	
		Lowest	10.56	....	3.14	
		Average	11.90	....	3.94	
The Doten Grain Co.'s Crown Fancy Winter Wheat Mixed Feed.	6	Highest	12.25	....	4.48	
		Lowest	11.44	....	3.22	
		Avrag e	12.01	....	3.95	
Manufacturer Unknown Kentucky Mixed Feed.	4	Highest	13.50	....	4.28	
		Lowest	9.13	11.00	3.25	
		Average	11.88	....	3.80	
Manufacturer Unknown Mixed Feed.	1	....	12.50	....	3.52	
The Bowker Co.'s Bowker's Animal Meal.	2	Highest	47.63	....	10.63	
		Lowest	39.75	30.00	9.10	5.00
		Average	43.69	....	9.87	
The Bowker Co.'s Bowker's Beef Scraps.	1	....	48.56	30.00	16.95	20
The Bowker Co.'s Bowker's Ground Beef Scraps.	1	....	56.00	60.00	18.94	14.00
Bradley Fertilizer Co.'s Bradley's Superior Meat Meal	1	....	48.75	40.00	9.93	15.00
N. W. Fertilizer Co.'s Horse Shoe Brand Ground Beef Cracklings.	1	....	64.63	60.00	18.26	16.00
The Armour Fertilizer Co.'s Meat Meal for Poultry.	1	....	58.88	60.00	17.60	16.00
Sagadahoc Fertilizer Co.'s Raw Ground Bone Meal.	1	....	27.94	18.75	2.44	

VIOLATION OF THE LAW.

Two samples of high grade *unguaranteed* cottonseed meal are reported. Sample 8850 was sent by a correspondent and 8896 was taken by the inspector. Both samples came from the same car. The violation was reported to the Secretary of Agriculture.

Seven samples of low grade cottonseed meal are reported. Samples 8866, 8872, 8880 and 8902, bearing the guarantee of S. A. & J. H. True Company, were, in accordance with the statement of that firm, all from one car. Three of the four samples were from correspondents and the other was drawn by the inspector. The violation was reported to the Secretary of Agriculture. The firm say that this "was purchased for the best of meal and this is what we obtained."

Sample 8871 was sent by a correspondent and was drawn from goods sold by S. W. Hamilton. Sample 8903 and 8916 were taken by the inspector at the request of the dealers in order that they might put a proper guarantee upon them.

All of the recent shipments of Chicago Gluten Meal are up to guarantee, 38 per cent of protein and 2 per cent fat. The goods shipped into the State in the summer of 1899 were below this guarantee, and the State agents of the manufacturers have supplied correctly guaranteed tags for the old goods.

King Gluten Meal varies greatly in composition, that low in fat more nearly resembles Chicago Gluten. As the high percentage of fat called for by the guarantee is of doubtful advantage and its absence is always accompanied by higher protein content, the falling off in fat in these samples has not been reported.

The unguaranteed sample (9012) of oil meal is from high grade goods. The firm was reported to the Secretary of Agriculture for not branding.

The unguaranteed Daisy Corn and Oat Feed (8926) was reported to the Secretary of Agriculture. One old lot of American Poultry Food was not guaranteed. All late shipments are guaranteed.

MIXED FEEDS.

In section 3 of the feeding stuffs law, it is stated that "mixed feeds" come under the requirements of the law. Under section 2, however, an exception is made of wheat rye and buckwheat bran or middlings not mixed with other substances. Soon after the law went into effect the Station analyzed a large number of the wheat offals which were being sold in the State and found them to be practically all good goods, although many of them were branded "mixed feed" and would therefore come under the law. After consultation with the Secretary of the Board of Agriculture it was decided for the present to omit all wheat offals from the requirements even though they might be denominated mixed feed.

In the fall of 1899 the Station began to receive from correspondents samples of goods that were bought for bran, but were of very low grade carrying from 9 to 12 per cent protein instead of the 15 to 17 per cent that good bran ought to carry. Investigation brought out the fact that certain mills in Kentucky and Tennessee and perhaps in other sections as well were adulterating bran by grinding and mixing with it such materials as corn cobs ,the waste from corn broom factories, and the like.

In the present bulletin there are given twenty-four analyses of four brands of these mixed feeds which carry a much lower percentage of protein than brans should. The handlers of these particular brands are at the present time placing guarantees and tax tags upon them. In view of the fact that these adulterations make it necessary for the Station to examine all mixed feeds in order to see whether they are straight wheat offals or not, it has been decided that from this time on the strict letter of the law will be observed, and that the only concentrated feeds which will not be subject to the requirements are the meals made from pure grains and wheat, rye and buckwheat brans or middlings.

All mixed feeds, even though they are the straight refuse from the milling of wheat, will be hereafter included in the requirements and it will be necessary for these goods to carry the brand, as defined in section 1 and the inspection tax tags, as defined in section 5 of the feeding stuffs law, chapter 334, Public Acts of 1897.

FEEDING CHICKENS FOR GROWTH.

G. M. Gowell.

COOPS VS. YARDS.

This study was undertaken to compare the rapidity of growth of chickens confined in small coops vs. chickens kept in sheds and small yards.

Ten coops, each with a floor space sixteen by twenty-three inches, were constructed of laths with close end partitions of boards. The floors were of laths placed three-fourths of an inch apart and one inch from the walls, so that they might be kept clean by the moving about of the birds. The coops were made two together without cutting the laths. The laths ran lengthwise of the coops on bottom, top and back, but on the front they were placed upright, and two inches apart so that the chickens could feed through between them readily. V-shaped troughs with three-inch sides were placed in front of and about two inches above the level of the floors of the coops.

These coops are of about the same size and form as those used by the English and French chicken fatteners who make a specialty of the business, fattening many thousands each year. They were located in the light, airy, cemented basement of the barn where they were free from disturbance, and the variations of temperature were not great.

The chickens used in the test were raised under similar conditions and from the same hatch. They were one hundred and thirty days old at the commencement of the test and all were pure blooded Barred Plymouth Rocks, White Wyandottes, or the Eaton strain of Light Weight Light Brahmas.

Four chickens were placed in each coop and fed on thick raw porridge, made by mixing meal with cold skimmed-milk, making it thick enough so it would drop and not run from the end of a wooden spoon.

The meal mixture employed was made up by mixing 100 pounds corn meal, 80 pounds wheat middlings, 50 pounds fine ground oats, and 40 pounds of fine animal meal. They were fed all of the porridge they would eat, twice each day. The troughs were removed and cleaned in half an hour after the commencement of each meal. They were constantly supplied with water.

Feeding was commenced August 24th and continued until September 28th—thirty-five days. The birds were weighed at the end of each week, at the same hour so that they might be equally empty of food at each weighing.

They consumed 477 pounds of meal and 84 gallons of skimmed milk. The forty chickens weighed at the commencement of the test 147.9 pounds and at its close 237.1 pounds and had gained 89.2 pounds, an average of 2.23 pounds per chicken live weight. The quantity of the dry meal required to produce a pound of gain was 5.94 pounds.

On the day that the feeding of the cooped birds was commenced, twenty of their mates were put in a house nine by eleven feet in size, with an attached yard twenty feet square. The yard was entirely bare of anything that would serve as green food.

They were fed, during the thirty-five days, on the same grain mixture with milk, as those confined in the small coops. The twenty birds weighed at the commencement of the test 66.6 pounds and at the close 116.0 pounds, making a gain of 49.4 pounds; an average of 2.47 pounds to each. The quantity of the dry meal required to produce a pound of gain was 5.52 pounds. In these tests greater total and individual gains and cheaper flesh productions were secured from the birds with partial liberty than from those in close confinement. The labor was less in caring for the yarded birds. The cooped birds were very quiet and did not appear to suffer from confinement.

When dressed, all of the carcasses in both lots were even, well-formed and handsome. The results indicate that there is no advantage in close confinement, but that rather greater gains and cheaper production result from partial liberty. That our success with the small coops was as good as that of the foreigners is shown by the reports of the English and Canadian fatteners. In another test made for the purpose of noting the effects of age, on the development and fleshing of chickens, as detailed beyond, it was incidentally shown that there is no advantage in very close confinement.

The tables which follow give the details of the experiments.

CHICKENS CLOSELY CONFINED IN COOPS AND FED THIRTY-FOUR DAYS

AGE OF CHICKENS AT COMMENCEMENT OF TEST—130 DAYS.

Coop.	Chickens.	Live Weights During Experiment.								Dressed weight.
		Aug. 24.	Aug. 31.	Sept. 7.	Sept. 14.	Sept. 21.	Sept. 28.	Increase. Lot.	Increase. Each.	
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	4 Plymouth Rocks ..	12.2	14.9	17.3	19.1	21.7	22.8	10.6	2.65	16.5
2	4 Plymouth Rocks ..	14.2	16.1	18.0	20.4	22.7	23.9	9.7	2.42	17.8
3	4 Plymouth Rocks ..	16.0	18.0	20.1	22.2	24.3	25.4	9.4	2.35	19.5
4	4 Plymouth Rocks ..	15.4	17.9	19.8	22.0	24.2	24.9	9.5	2.37	19.7
5	4 Plymouth Rocks ..	14.5	16.8	18.8	20.3	22.8	23.7	9.2	2.30	18.4
6	4 Plymouth Rocks ..	13.4	15.0	17.1	18.6	20.7	22.0	8.6	2.15	16.4
7	4 Plymouth Rocks ..	16.2	18.2	20.1	21.8	23.8	24.2	8.0	2.00	19.8
8	4 White Wyandottes	14.8	16.7	18.8	19.9	21.6	22.3	7.5	1.87	16.8
9	4 Brahmas	16.4	19.2	21.3	22.6	24.4	25.5	9.1	2.27	19.0
10	4 White Wyandottes	14.8	17.2	19.0	20.3	21.7	22.4	7.6	1.90	16.8
	Total weights ...	147.9	170.0	190.3	207.1	227.9	237.1	......	......	180.7
	Increase in weight..	....	22.1	20.3	16.8	20.8	9.2	89.2	2.23	......

Pounds of grain mixture required to produce a pound of gain 5.94.

TWENTY CHICKENS (FOURTEEN PLYMOUTH ROCKS, FOUR WHITE WYANDOTTES, TWO BRAHMAS) CONFINED IN HOUSE AND SMALL YARD AND FED THIRTY-FIVE DAYS.

AGE OF CHICKENS AT COMMENCEMENT OF TEST—130 DAYS.

Live Weight.				Total dressed weights.
August 24.	September 28.	Increase in weights. Total.	Increase in weights. Each.	
Lbs. 66.6	Lbs. 116.0	Lbs. 49.4	Lbs. 2.47	Lbs. 92.0

Pounds of grain mixture required to produce a pound of gain, 5.52.

Financial Results.

Taking the sixty cooped and uncooped birds together and considering the gains in flesh, and the cost of the food used, enables us to form opinions as to the advisability of selling chickens from the range when in growing condition, or specially preparing them for higher priced markets.

If these birds had been dressed without fattening at the commencement of the feeding test, and had shrunk the same per cent that they did when slaughtered, they would have yielded 165.5 pounds of dressed meat worth at 13 cents per pound, $21.51. At the close of the test they dressed 272.7 pounds and were sold at 15 cents per pound net, yielding $40.90. This shows that their value was increased by fattening $19.39. The increase was probably more than this amount as we found in other tests that the percentage of shrinkage in dressing lean chickens was greater than in fat ones. Thirteen cents was as much as the unfattened birds would have sold for—slowly—while the fattened ones sold quickly in the same market at fifteen cents per pound. They were very much improved in quality by fattening. The flesh was white and soft and when roasted the thighs were soft, juicy and free from strings.

The amount of the dry food used was 750 pounds and cost $7.91. The skimmed milk was 140 gallons, worth $2.80, making the total food used worth $10.71, which amount taken from the increased value of the chickens leaves a balance of $8.68 gain on the sixty birds; an average increase of a little more than 14 cents on each one above the cost of food used.

A very large proportion of the chickens raised in this State are sent to market alive, without being fattened, usually bringing to the growers from twenty-five to thirty-five cents each. These tests indicate that they can be retained and fed a few weeks in inexpensive sheds or large coops with small runs and sent to the markets as dressed meat and make good returns for the labor and care expended.

The quality of the well-covered, soft-fleshed chickens, if they are not too fat, is so much superior to the same birds not specially prepared that they will be sought for at the higher price. The dairy farmer is especially well prepared to carry on this work as he has the skimmed milk which is of the greatest importance in securing yield and quality of flesh.

EFFECTS OF AGE.

In order to compare the gains made with chickens of different ages, twenty of the same hatch that were used in the previous tests were taken for the later feeding. When the former tests were started the birds were one hundrd and thirty days old. This test was commenced when they were one hundred and seventy days old. During the time that their mates had been shut up for fattening, they had the libertv of a large yard with an abundance of green food. They had been fed mash in the morning and mixed grain and cracked corn at noon and night. They had been growing bone and muscle but were not meaty. Twenty of them were put in the small coops—four in each one—and fed from the same meal and milk mixture that was used in the previous tests. When the experiment began, October 11th, they weighed 100.2 pounds. They were fed twenty-one days and then weighed 117.5 pounds having gained 17.5 pounds, an average to each bird of .87 pounds. They consumed 144 pounds of the dry meal and the same relative amount of milk as in the earlier test. 8.2 pounds of the mixed meal was required to make a pound of live chicken. With the confined young birds in the previous test but 5.94 pounds of food were required to yield a similar amount. The gain per bird of .87 pounds was markedly less than that of the younger birds of 1.48 pounds during the first twenty-one days of their test.

When these chickens were put in the small coops twenty-five of their mates of the same hatch were put in a house nine by eleven feet with a yard twenty feet square, and fed twice a day on the same mixture of meal and milk. None of the birds received green food. During the twenty-one days they gained 23.2 pounds, an average per bird of .92 pounds, while in the previous test with the young yarded chickens, the average gain during the first twenty-one days was 1.59 pounds.

This decreased gain in the case of the older chickens corresponds with the recognized law in animal feeding, that the younger the creature is the less the quantity of food required to produce a pound of growth. For the moderate difference (6 weeks) in the ages of the two lots of chickens this variation in the amounts of food required to produce a pound of gain seems extravagant, but when it is considered how rapidly chickens mature it is not unreasonable. The practice of successful poultrymen in selling the cockerels at the earliest marketable age is well founded, for the spring chicken sold at Thanksgiving time is an expensive product.

The average live weights of the two lots at slaughtering was very nearly alike, viz. 5.88 pounds for the younger and 5.83 pounds for the older ones. The young ones were better in appearance, being thicker meated and softer, while the older ones showed a trifle more bone and a little harder flesh.

The details of the test are given in the tables which follow.

CHICKENS CLOSELY CONFINED IN COOPS AND FED TWENTY-ONE DAYS.

AGE OF CHICKENS AT COMMENCEMENT OF TEST—177 DAYS.

Coop	Chickens.	Live Weights During Experiment.						Dressed.
		Oct. 11.	Oct. 18.	Oct. 25.	Nov. 1.	Increase.		
						Lot.	Each.	
1	Four Plymouth Rocks	18.5	20.5	21.0	22.0	3.5	.87	17.4
2	Four Plymouth Rocks	20.2	21.4	22.6	24.4	4.2	1.05	19.3
3	Four Plymouth Rocks	20.8	22.4	22.8	23.5	2.7	.67	19.0
4	Four Plymouth Rocks	18.7	20.4	21.0	22.4	3.7	.94	18.6
5	Four Plymouth Rocks	22.0	23.3	25.2	25.4	3.4	.85	19.3
	Total weight	100.2	108.0	112.6	117.7	......	......	93.6
	Increase in weight	....	7.8	4.6	5.1	17.5	.87	......

Pounds of grain mixture required to produce a pound of gain, 8.2.

TWENTY-FIVE PLYMOUTH ROCK CHICKENS CONFINED IN HOUSE AND SMALL YARD AND FED TWENTY-ONE DAYS.

AGE OF CHICKENS AT COMMENCEMENT OF TEST—177 DAYS.

Live Weight.				Total dressed weights.
October 11.	November 1.	Increase in weight.		
		Total.	Each.	
Lbs. 121.7	Lbs. 144.9	Lbs. 23.2	Lbs. .92	Lbs. 115.2

Pounds of grain mixture required to produce a pound of gain, 7.63.

Financial Results.

The forty-five birds weighed 221.9 pounds at the beginning of the test. If they had been dressed at that time and had shrunk at the same rate as they did when they were slaughtered they would have yielded about 177 pounds of dressed meat, worth at thirteen cents a pound $23.01. They ate 321 pounds of mixed meal costing $3.40, and 60 gallons skimmed milk worth $1.20, altogether $4.60, which taken from the increased value of the chickens leaves $3.71 as the net gain,—not accounting for labor—or an average of 8.25 cents for each chicken.

Although the chickens employed in this test had been growing during the five weeks in which their mates in the first test had been undergoing fattening, they had not improved in condition sufficiently to sell at a better price per pound than at the commencement of the first test.

THE EFFECT OF GREEN FOOD.

To study the effect of green food in fattening chickens, the following trial was made with twenty-four pure-blooded Plymouth Rock chickens that were one hundred and forty days old at the commencement of the test. They were confined in the small coops, described on page 89, four in each coop, and all fed for four weeks on the mixed meal and milk porridge twice each day.

The birds in coops 1 and 2 received no green food. Those in coops 3, 4, 5, and 6 received no green food during the first and second weeks, but during the third and fourth weeks they were given all the finely chopped green rape they would eat once a day. They did not consume as much of the rape per day as they had previously while living in the large yards, where they ate it voraciously. The quantity of porridge eaten by them was not noticeably greater or less when the rape was supplied. The gains made while the birds were supplied with green food were hardly as great as while confined to the porridge alone, but the difference was not very great.

The following table gives the details of the experiment.

TWENTY-FOUR PLYMOUTH ROCK CHICKENS FED TWENTY-EIGHT DAYS WITH AND WITHOUT GREEN FOOD.

LIVE WEIGHTS DURING EXPERIMENT.

Coop.	Feed.	Beginning.	End of first week.	End of second week.	End of third week.	End of fourth week.	Increase. First and second weeks.	Increase. Third and fourth weeks.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	No rape	14.1	16.	18.2	20.3	22.6	4.1	4.4
2	No rape	15.7	17.8	19.5	21.8	23.6	3.8	4.1
3	No rape	15.4	17.6	19.4	-	-	4.0	-
3	Rape	-	-	-	2.01	22.6	-	3.2
4	No rape	14.6	16.9	18.9	-	-	4.3	-
4	Rape	-	-	-	20.4	22.7	-	3.8
5	No rape	13.8	15.4	17.5	-	-	3.7	-
5	Rape	-	-	-	18.9	21.0	-	3.5
6	No rape	15.8	17.8	19.7	-	-	3.9	-
6	Rape	-	-	-	21.5	23.4	-	3.7

Were it not for the check coops 1 and 2, the query might arise whether there might not be diminished gains from prolonged confinement during the 3d and 4th weeks. Coops 1 and 2 received no green food at any time, and their gains were a little better during the last than the first weeks. Although from experience we are persuaded of the value and even necessity of a free supply of green food for young growing chickens and breeding fowls, in this short period with rations composed so largely of milk, the growth was quite as satisfactory without an accompaniment of green food.

BREEDING FOR EGG PRODUCTION.

G. M. GOWELL.

For several years the Station has been breeding with the hope of establishing families or strains of hens that shall excel as egg producers. It is known that the laws of inheritance and transmission are as true with birds as with cattle, sheep and horses, and when we consider the wonderful advance in egg production that the hen has made since domestication, there is ample reason for assuming that a higher average production than the present can be secured by breeding only to birds that are themselves large producers. It was found in practice that with the most careful selection we were including in our breeding pens birds that were not great producers, and that it was a prime necessity to ascertain the exact record of the eggs produced by each individual. This led to devising the trap nest described in the report of this Station for 1898.*

This work, as undertaken, of breeding for more and better eggs will of necessity require much time, and several years will probably elapse before marked results may be looked for.

At this time cockerels are being raised from the hens that gave over two hundred eggs last year for our breeding next season. Among the two hundred additional hens undergoing test this year, it is hoped to find other large yielders and that next year we may have some pens where both the males and females will be from large producing dams. The three breeds taken for this work are kept separate and pure.

The first year's work in this selection of stock is here reported as a matter of record and not because definite results have yet been obtained.

Pure bred birds from three breeds were used, viz., Barred Plymouth Rocks, White Wyandottes, and the Eaton Strain of Light Brahmas. Two hundred and sixty April and May hatched pullets were put into breeding pens, November 1, 1898,

* A reprint of the paper describing the trap nest will be sent on application.

and records kept of their individual productions for a year. The purpose was to save those with yearly yields of one hundred and sixty eggs and over, and those with yields of one hundred or less, so as to see what variations there were in the individuals comprised in the flocks. As the room was needed for other birds on October 10th, 1899, some of the hens that had not sufficient time remaining in which to reach a yield of one hundred and sixty eggs in the year since commencing to lay, and that had produced one hundred eggs within the year were taken out of the test, consequently the average yield of all the hens for the full year cannot be given.

Of the two hundred and sixty hens put into the test, five died during the year and nineteen were stolen. Of the two hundred and thirty-six remaining, thirty-nine each laid one hundred and sixty or more eggs and thirty-five laid less than one hundred each. Twenty-four of the one hundred and twenty-six Plymouth Rocks laid one hundred and sixty or more eggs each, and twenty-two laid less than one hundred each. Nine of the fifty-six Wyandottes each laid more than one hundred and sixty eggs and seven laid less than one hundred each. Six of the fifty-four Light Brahmas each laid more than one hundred and sixty eggs and six laid less than one hundred each. All birds were put into the test November first at which time some of the earliest ones had been laying for about two weeks. The year commenced November first for all birds that laid during that month. Some of the later hatched ones did not commence to lay until January and February and they were given a full year after they commenced.

The monthly records of the hens that laid more than 160 or less than 100 eggs in the first 12 months after they began laying follow.

EGG RECORDS OF HENS HATCHED IN 1898 WHICH LAID MORE THAN 160 OR LESS THAN 100 EGGS IN THE FIRST 12 MONTHS AFTER THEY BEGAN LAYING.

FROM 126 BARRED PLYMOUTH ROCKS.

Number of the hen.	1898.		1899.												Total.
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
286.....	....	.....	.....	14	23	15	18	24	25	23	26	23	1	.....	*206
101......	.....	. ..	18	15	21	21	24	21	17	26	17	21	3	.....	204
36......	....	15	9	23	23	19	16	21	19	13	15	8	20	.....	201
51......	.....	7	14	14	20	17	16	24	24	22	18	15	.....	.....	191
7......	19	11	19	19	23	16	16	14	14	17	21	.....	....	.....	189
120......	.....	.....	17	20	17	13	15	18	24	20	22	18	4	.....	188
74......	....	5	18	18	21	14	18	16	15	15	7	18	17	.....	182
70	.....	8	24	19	21	17	13	16	17	19	19	6	2	.....	181
126......	....	.....	11	12	21	19	18	20	14	11	15	11	14	14	180
10......	16	14	5	20	23	19	19	18	17	10	14	.....	....	.. ..	175
31	6	5	9	22	23	20	20	18	19	16	9	8	.....	.....	175
159......	.....	. ...	4	25	9	13	13	14	14	12	15	18	20	18	175
300......	.....	.....	.....	19	18	11	17	14	13	17	8	21	20	17	175
289......	.....	.....	.....	8	22	20	17	19	12	20	12	21	14	7	172
76......	.....	. ...	15	20	18	18	22	19	24	19	14	.....	.....	.....	169
45......	....	17	22	19	22	17	15	14	13	11	7	9	13	1	166
205.....	.....	.....	.....	.....	.....	.....	.....	22	19	19	15	.....	.....	.....	166
30	7	7	18	16	19	19	19	20	22	8	8	2	... .	.. ..	165
209......	.....	....	2	20	20	18	18	13	17	17	12	17	10	.....	164
40......	3	6	5	20	17	12	14	20	20	24	18	3	.....	.....	162
6	18	12	7	15	18	16	15	8	14	6	12	20	. ...	.....	161
117......	.....	.....	10	2	20	24	17	19	23	25	20	1	.....	.....	161
80......	.....	. ...	16	22	15	7	17	17	15	9	10	12	15	5	160
154.....	....	.....	5	12	20	21	22	22	18	21	18	1	.....	.....	160
89......	....	.....	13	13	16	8	15	16	14	3	.....	.....	....	.....	98
184......	.....	.....	.....	9	19	17	22	17	....	6	6	1	.....	.....	97
21......	10	16	7	16	.....	10	9	12	12	4	.....	.....	.....	.....	96
42......	2	10	.....	13	6	8	12	15	11	8	5	.....	.....	.....	90
157......	.....	.....	.....	19	13	12	8	11	15	4	6	1	.....	.....	89
160......	.....	1	4	6	15	12	9	6	12	15	8	.....	.....	.....	88

* No. 286 was a late hatched pullet and did not begin laying until Feb. 12. To give her a full year she received credit for 14 eggs laid in January, 1900.

EGG RECORDS OF HENS—CONTINUED.

Number of the hen.	1898.		1899.												Total.
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
95	.....	3	19	8	10	9	11	4	11	6	5	.....	.....	.....	86
72	2	13	11	8	2	8	15	7	3	11	.....	.....	.....	.....	80
58	.....	1	18	16	15	3	11	6	5	4	.....	.....	.....	.....	79
183	.....	.....	.....	2	26	7	15	12	13	1	.....	.....	.....	.....	76
258	.....	.....	.....	2	21	7	2	9	10	4	20	1	.....	.....	76
264	.....	.....	.....	5	16	9	12	14	15	2	.....	.....	.....	.....	73
233	.....	.....	.....	14	19	6	13	10	9	.....	.....	.....	.....	.....	71
239	.....	.....	.....	13	21	.....	14	5	5	8	.....	.....	.....	.....	66
207	.....	.....	2	20	7	11	9	1	7	4	3	.....	.....	.....	64
176	.....	.....	.....	12	10	.....	11	14	6	.....	.....	.....	.....	.....	53
41	.....	16	3	.....	.....	.....	.....	19	8	6	.....	.....	.....	.....	52
256	.....	.....	.....	1	18	8	3	11	12	3	1	.....	.....	.....	47
254	.....	.....	.....	3	7	4	14	9	8	.....	.....	.....	.....	.....	45
236	.....	.....	.....	1	18	4	10	.....	5	.....	.....	.....	.....	.....	38
162	.....	.....	9	9	8	2	3	5	1	.....	.....	.....	.....	.....	37
234	.....	.....	.....	9	17	.....	6	4	.....	.....	.....	.....	.....	.....	36
FROM 56 WHITE WYANDOTTES.															
14	21	20	24	21	19	17	10	18	14	16	15	13	.....	.....	208
4	20	.....	19	16	22	13	19	22	15	21	19	15	.....	.....	201
47	.....	12	19	18	19	16	19	17	19	15	14	16	16	.....	200
8	14	17	13	14	18	17	15	11	12	14	15	10	.....	.....	170
280	.....	.....	.....	5	1	13	23	18	21	15	21	21	17	15	170
242	.....	.....	.....	15	24	13	16	16	17	14	12	14	12	14	167
203	.....	.....	2	21	17	16	10	15	16	15	13	14	13	14	166
134	.....	.....	9	16	16	17	14	16	14	10	15	6	16	16	165
215	.....	.....	1	17	19	8	21	13	17	18	22	12	11	6	165
108	.....	.....	16	22	15	13	14	9	.....	.....	.....	.....	.....	.....	89
18	9	.....	3	18	10	12	5	15	8	.....	.....	.....	.....	.....	80
79	.....	.....	13	18	14	10	11	8	5	.....	.....	.....	.....	.....	79
158	.....	.....	.....	21	5	13	.....	15	7	9	6	2	.....	.....	78
255	.....	.....	.....	3	18	14	11	20	8	.....	.....	.....	.....	.....	74
267	.....	.....	.....	12	21	6	14	18	2	.....	.....	.....	.....	.....	63
170	.....	.....	3	10	11	7	8	11	9	.....	.....	.....	.....	.....	59

EGG RECORDS OF HENS—CONCLUDED.

FROM 56 LIGHT BRAHMAS.

Number of the hen.	1898.		1899.												Total.
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
52	.....	11	19	20	21	20	19	20	21	18	19	1	5	.....	194
139	.....	.....	11	20	19	14	21	19	21	21	22	20	.....	6	194
61	.....	4	12	18	21	16	14	21	19	15	16	16	18	.....	190
43	.....	5	18	21	21	14	19	22	18	19	21	3	.....	.....	181
292	.....	.....	.....	21	22	12	17	16	15	16	16	13	13	20	181
50	.....	17	19	20	17	19	14	14	13	10	13	5	18	.....	179
296	.....	.....	.....	18	16	6	6	14	10	5	8	4	.....	.....	87
198	.....	.....	.....	10	14	17	1	14	15	8	2	5	.....	.....	86
243	.....	.....	.....	3	10	10	16	18	3	7	8	.....	.....	.....	75
227	.....	.....	.....	6	24	8	7	8	6	.....	.....	.....	.....	.....	59
55	.....	.....	.....	6	11	9	3	10	7	8	1	.....	.....	.....	55

A study of the monthly record sheets shows great differences in the capacities of hens, and marked variations in the regularity of their work; some commencing early and continuing laying heavily and regularly month after month while others varied much, laying well one month or poorly or not at all the next.

It is impossible to account for these vagaries as the birds in each breed were bred alike and selected for their uniformity. All pens were of the same size and shape and contained the same number of birds. Their feeding and treatment were alike throughout. Whenever changes were made in the feed in one pen, they were made in the others. That they were in good health is shown by the fact that but two were ailing, and were taken out early; two crop bound; and one injured by rough treatment by a cockerel. Many of the lightest layers gave evidence of much vitality and in many instances there were no marked indications in form or type by which we were able to account for the small amount of work performed by them. Numbers 234, 70 and 236 yielded respectively 36, 37 and 38 eggs in the year. They were of the egg type and gave no evidence of weakness or masculinity.

Number 101, 286, 36, 47 and 14, with their yields of 204, 206, 201, 200 and 208 eggs during the year, were typical birds with every indication of capacity, but they were equaled in appearance, in the minds of good judges, by other birds that yielded a much less number of eggs.

The size and uniformity of the eggs yielded are of a good deal of importance. It was very noticeable in these investigations that the eggs from hens that laid the greatest numbers averaged smaller in size than those from hens that did not produce so many. That this is not always the case is shown by the eggs from numbers 101 and 286 which were of good size and dark brown, while those from number 36 were small and lacking in color. For this defect number 36 has been excluded from the breeding pens.

Number 14 is a good, large, strong White Wyandotte and because of the quantity and quality of her productions she is a phenomenal bird. When she went into the test November 1st, 1898, she had been laying for over two weeks. At the end of the year she had two hundred and eight good brown eggs to her credit, and she still kept on, laying 18 eggs in November, 22 in December, 21 in January, 18 in February, 15 in March and 18 in April (just closed) giving her 112 in the first six months of her second year, and 320 in eighteen months, a little more than an egg in a day and three-fourths for the entire year and a half after she commenced laying.

When the eggs from the hens that had been laying long and freely were placed in incubation, many of them were found low in fertility, or entirely sterile, notwithstanding the hens had mated freely with vigorous cockerels. The percentage of infertility was much greater than in eggs from hens that had been laying moderately. The question arises whether a large percentage of the chickens raised each year are not the produce of the tardy and moderate layers that are comparatively fresh, rather than of the more valuable and persistent layers that have been hard at work all winter? If this is so, breeding from eggs as they are ordinarily collected, without a knowledge of the hens that produce them, can but tend to furnish a large proportion of chickens from the poorest hens in the flocks. The cockerels as well as the pullets raised in this way furnish the breeding stock for the next year and in this manner the reproduction of the poorer rather than the better birds is fostered.

COFFEE SUBSTITUTES.

CHAS. D. WOODS and L. H. MERRILL.

During the last few years there has been a marked increase in the number of mixtures offered under different names as substitutes for coffee. Some of the earlier mixtures contained low grade coffee to give them flavor, but a quite exhaustive examination a year or two ago by the Connecticut Experiment Station showed them to be free from adulterations of this kind and that for the most part they are made from the cereal grains as claimed. Because of the extravagant claims made for the nutritive value of the decoctions prepared from these materials the following analyses were undertaken. The comments here made are in no wise intended to condemn these beverages but to point out that the claims for great nutritive value are not founded on fact. Whether hot beverages are or are not hygienic, a chemical study cannot show, but from the chemical composition of the infusions it is a simple task to pass upon their merits as food.

The materials here reported upon were purchased in the open market. No attempt was made to obtain samples of all of this class of preparations but it is believed that those here reported upon are fairly representative.

Description of Samples.

No. 6179. *Postum Cereal* made by Postum Cereal Company, limited, Battle Creek, Mich. This is probably the most extensively advertised of any of the coffee substitutes. The following is from statements on the package.

"A toothsome and healthful beverage. Coffee sick people seldom charge their ill feelings to the true cause. Analytical chemistry shows the poisonous alkaloids of coffee, as in tobacco, whisky and morphine. A perfectly healthy man or woman can stand these for a time, but 'constant dripping wears a stone' and finally headache, torpid liver, sick stomach or heart, and that 'weak all over' feeling show that a poisoned nervous system is calling for help and relief. Every morning and perhaps at dinner and supper another brutal blow is given. Small wonder that a fixed organic disease of some of the members is finally set up. Relief cannot be obtained unless the cause is removed."

"An honest product of the healthful grains given by all-wise nature for man's proper sustenance. It nourishes, strengthens and vitalizes."

"This natural food drink has a fragrance of its own. It is not tea or coffee, but is made from the healthful grains. Those who care to conserve their health and bodily vigor will find that the unnatural taste for tea and coffee will leave them in a few days, and a natural taste for a healthful drink will take its place."

No. 6180. *Caramel Cereal* manufactured by Battle Creek Sanitarium Health Food Company, Battle Creek, Mich. "A mixture of cereals so prepared as to constitute a wholesome substitute for coffee."

No. 6181. *Golden Grain Coffee* prepared by John A. Tibbs, Buffalo, N. Y. "Recommended by the medical profession for its nutritious and healthful properties."

"Contains the phosphorus besides other nourishment of the grain in a concentrated form."

"Children may be allowed free use of this preparation at each meal, as it is always wholesome, and in some cases may be preferable to milk."

No. 6182. *Old Grist Mill Entire Wheat Coffee,* Potter & Wrightington, agents, Boston, Mass. "Healthful and nutritious. The best substitute for coffee."

"Old Grist Mill Entire Wheat Coffee is a perfect hygienic product containing the entire wheat kernel roasted and ground."

"It aids digestion, is easily assimilated by the weakest stomach, and assists nature in preserving the complexion clear and fresh. It is in every sense a pure health food."

No. 6183. *Wheat-Shred Drink* manufactured by The Cereal Machine Company, Worcester, Mass. "A perfect food in liquid form." "Wheat-Shred Drink, is nutritive in the highest degree."

No. 6288. *Grain-o* prepared by the Genesee Pure Food Company, LeRoy, N. Y. "Grain-o is a pure food drink." "Grain-o aids digestion." "Has that rich seal brown of Mocha or Java, but it is made from pure grains and the most delicate stomach receives it without distress. It's nourishing and strengthening."

No. 6289. *Dr. Johnson's Cereal Coffee.* Wholesale and retail at Johnson Educator Food Store, No. 82 Boylston street, Boston, Mass. "A palatable, nutritious and wholesome beverage."

No. 6290. *MO-KO* prepared by John F. Bauer & Company, Mt. Morris, N. Y.

"Mo-ko aids digestion, soothes and quiets worn and wasted nerves." "Mo-ko, as a complexion beautifier, cannot be equalled. It tones the blood, and by its daily use will impart to the skin the healthful glow of youth." "Give the children Mo-ko to drink. It will make them strong and healthy, and will not injure them."

ANALYSIS OF THE WATER-SOLUBLE CONSTITUENTS OF COFFEE SUBSTITUTES.

Laboratory number.	Coffee substitute.	* Refuse.	Soluble in Water.			
			Total solids.	Protein.	Carbo-hydrates.	Ash.
		%	%	%	%	%
6179	Postum Cereal	48.8	51.2	3.1	44.9	3.2
6180	Caramel Cereal	71.5	28.5	2.0	23.8	2.7
6181	Golden Grain	77.6	22.4	4.9	13.4	4.1
6182	Old Grist Mill Coffee	64.9	35.1	5 6	26.9	2.6
6183	Wheat-Shred Drink	61.0	39 0	2.5	34 5	2.0
6288	Grain-O	53.2	46.8	2.5	42.5	1.8
6289	Dr. Johnosn's Cereal Coffee	63.7	36.3	3.3	31.3	1.7
6290	Mo-Ko	72.0	28.0	1.4	25.1	1.5

The portions insoluble in water including the water in the preparations as sold.

From the above table it will be observed that Postum Cereal is the most soluble and Golden Grain the least soluble of the samples analyzed. The directions for preparation are quite different but in each case the coffee substitute is measured by spoonfuls and the water by cups. Measuring the material by rounded spoonfuls and assuming a cup to hold 180 cubic centimeters (about 5 cups to a quart) gives the figures in the following table:

AMOUNT OF INFUSION YIELDED BY ONE POUND OF THE COFFEE SUBSTITUTE WHEN PREPARED AS DIRECTED.

Laboratory number.	Coffee Substitute.	Liters.	Quarts.	Cups (180 cc.)
6179	Postum Cereal	10.31	10.9	57
6180	Caramel Cereal	11.34	12.0	63
6181	Golden Grain	15.12	16.0	83
6182	Old Grist Mill Coffee	32.40	34.1	180
6183	Wheat-Shred Drink	5.89	6.2	33
6288	Grain-O	6.48	6.9	36
6289	Dr. Johnson's Cereal Coffee	4.54	4.8	25
6290	Mo-Ko	3.63	3.8	20

The directions for preparation have no relation to their different solubilities, so it does not follow that the least soluble material makes the thinnest drink. For example, Caramel Cereal is less soluble than Old Grist Mill Coffee but when prepared in accordance with directions, the infusion of the former contains more than twice as much solids as that of the latter.

Skimmed milk is generally considered a pretty thin beverage but as seen from the following table it contains from three to twenty times as much solids as these so-called nutritious drinks. Wheat-Shred Drink is perhaps a fair illustration of these goods. The label claims it to be "nutritive in the highest degree" and yet one would have to drink four and one-half *gallons* of the infusion to get the amount of protein furnished by one *quart* of skimmed milk. A teacup full (1-5 of a quart) of the decoction of Postum Cereal, which it is claimed "nourishes, strengthens and vitalizes" contains about 1-7 of an ounce of solids (dry matter) and about 1-100 of an ounce of protein (nitrogenous matter). While it would take nearly 1-4 of a cup of skimmed milk to furnish this weight of solids, the protein of a cup of Postum Cereal is contained in a dessert spoonful of skimmed milk.

As stated above, the present paper has nothing to do with the hygienic question of hot or cold drinks. Viewed from the nutritive standpoint alone the following table shows that these coffee substitutes, like coffee itself, depend more for their food value upon the cream and sugar used than upon their own soluble constituents.

NUTRIENTS FOUND IN SKIMMED-MILK COMPARED WITH THOSE FOUND IN COFFEE SUBSTITUTE INFUSIONS PREPARED ACCORDING TO PRINTED DIRECTIONS.

Laboratory Number.		Total Solids.	Protein.	Fat.	Carbohydrates.	Ash.
		%	%	%	%	%
	Skimmed milk	9.75	3.50	.30	5.15	.80
6179	Postum Cereal	2.25	.14		1.97	.14
6180	Caramel Cereal	1.14	.08		.95	.11
6181	Golden Grain	.67	.15		.40	.12
6182	Old Grist Mill Coffee	.50	.08		.38	.04
6183	Wheat-Shred Drink	3.00	.19		2.66	.15
6288	Grain-o	3.28	.17		2.98	.13
6289	Dr. Johnson's Cereal Coffee	2.63	.33		3.13	.17
6290	Mo-Ko	3.50	.18		3.14	.19

NUT OILS.

L. H. MERRILL.

In the summer of 1899 seventeen kinds of nuts were analyzed at this Station. The results of these analyses, together with a discussion of nuts as foods, were published in Bulletin 54. In those cases where the material at hand allowed, a sufficient amount of oil was obtained to permit a determination of the fuel value and a few other constants. Since several nut oils have already found an extended use, a contribution to the knowledge of those less known may prove of interest.

The nut kernels were finely ground and the dried material extracted with anhydrous ethyl ether. The solvent was removed by heating the solution upon the steam bath for one hour, or until the smell of ether had entirely disappeared, when the hot oil was filtered into bottles.

Several objections to this method of extraction suggest themselves, chief among which may be mentioned: (a) A possible failure to entirely remove the ether; (b) The oxidation of the oils in the final heating; (c) The presence of ether-soluble foreign matters which were present in the nuts and passed through into the oils.

Some of these dangers might have been avoided by using pressure instead of a solvent. But the use of pressure introduces another difficulty. Each of these oils consists of a mixture of from three to six or even more ethereal salts of widely varying fluidity. For this reason extraction by pressure must inevitably result in a partial separation of the oils, the less fluid remaining behind. The pressure method was employed in but one case, that of the cocoanut. It is interesting to note that in this particular instance the resulting oil (6227) differed but slightly from that obtained by ether from the same nut (6228). If a solvent be used, ether seems as little objectionable as any, since it is more readily removed from the extract than petroleum ether, and the second danger mentioned, that of oxidation, is materially reduced. As regards the third objection, the extraction of matters not oils, it should be said that so far as known there is no practicable method of extraction which would yield a mixture of pure fats. Petroleum ether undoubtedly yields an extract freer from impurities than ethyl ether, but its higher boiling point would render it more difficult to remove.

Some of these nut oils are very complex compounds. Cocoanut oil contains large proportions of trimyristin and trilaurin, smaller quantities of tripalmitin and triolein, and also the glycerides of the volatile caproic, caprylic and capric acids.* The walnut contains myristic and lauric acids, together with oleic, linolic, linolenic and isolinolenic acids.† Among the bodies not fats which frequently occurs are the lecithins, cholesterin and chlorophyl.

Of the oils here reported, those from the cocoanut and pistachio present the most marked peculiarities. Above 24° C. the former is perfectly colorless and clear as water. At the ordinary room temperature it hardens to an opaque white solid. The pistachio oil is a dark yellowish green, perhaps through the presence of chlorophyl. All the other oils are fluids at ordinary temperatures and to the casual observer present few points of difference, except as regards color, which varies from light straw to deep amber. For the most part they are without pronounced odor, though several readily suggest the nuts from which they were derived.

The instrument used in determining the refractive index was that of the Societé Genevoise, furnished for the purpose by Prof. Stevens of the department of physics of the University. The instrument permits very accurate measurements. Although from four to six readings were taken for each oil, the variations were for the most part confined to the fifth decimal, here omitted. The temperature selected was that of the room at the time the work was begun. The specific gravity was determined by a carefully calibrated pyknometer, the standard chosen being distilled water at the same temperature, 24° C. The combustions were made in a bomb calorimeter of the Atwater model, made by O. S. Blakeslee of Middletown, Conn. Even with the usual pressure of oxygen, twenty atmospheres, it was found impossible to ignite the oil directly. After several unsuccessful

* Lewkowitsch, Oils, Fats and Waxes, p. 538.

† Ibid, p. 350.

attempts of this kind, weighed filter blocks were used to absorb the oil. By previous experiments the fuel value of these blocks was found to be 4.130 calories per gram. For the iodine absorption number, Hubl's method,* as adopted by the Association of Official Agricultural Chemists, was employed. The great capacity of some of the oils for iodine made necessary the addition of large quantities of the iodine solution, as in the case of the walnut oil, where 70cc were used. This fact is important since the method is an arbitrary one, the amount of the absorption being to some extent affected by the excess of iodine present. The results are not, therefore, so strictly comparable as in the case of butters, where the absorption varies so little that a constant amount of iodine can be used.

So far as the writer is aware no study has been made of the changes which these oils undergo through rancidity. They are so susceptible to such changes that the age of the nut must to a considerable extent affect the physical and chemical properties of the oils. The work here reported was done during the summer months and the nuts must therefore have been nearly a year old.

As regards the changes which oils may undergo by heating, attention may be called to the oils from the raw and roasted peanuts (6225 and 6226). Although the roasting was carried farther than usual, resulting in a decided darkening of the oil, the constants so far as determined were practically the same. It is probable that the drying oils, containing considerable amounts of linolic, linolenic and isolinolenic acids, would have undergone appreciable oxidation under the same conditions.

The refractive index, the specific gravity, the idoine absorption number, and the calories per gram of the different nut oils here reported are given in the table on the following page.

* Wiley's Agricultural Analyses, vol. III, page 364.

CONSTANTS OF NUT OILS.

Laboratory number.	Kind of Nuts.	Refractive index, 20°C.	Specific gravity, 24°C.	Idoine absorption number.	Calories per gram.
6216	Beechnuts, *Fagus Americana*	1.4715	.9124	97.31	9.511
6217	Brazil nut, *Bertholletia excelsa*.......	1.4699	.9156	90.59	9.426
6218	Butternut, *Juglans cinerea*...........	1.4786	.9255	129.09	9.417
6219	Filbert, *Corylus*........................	1.4686	.9158	82.74	9.510
6220	Hickory, *Hicoria ovata*	1.4696	.9164	102.79	9.450
6221	Pecan, *Hicoria pecan*..................	1.4708	.9158	99.47	9.497
6222	Pistachio, *Pistachia vera*.............	1.4687	.9134	83.82	9.412
6223	Pine nut, *Pinus edulis*................	1.4659	.9174	105.80	9.448
6224	Walnut, *Juglans regia*................	1.4770	.9224	138.84	9.438
6225	Peanut, raw, *Arachis hypogæa*	1.4701	.9136	92.51	9.750
6226	Peanut roasted.......................	1.4697	.9142	92.37	9.577
6227	Cocoanut, *a*, *Cocos nucifera*	1.4550	.9228	6.17	9.027
6228	Cocoanut, *b*	1.4553	.9223	6.27	9.066
	Brazil nut, *c*	... .	.9182	106.20	
	Cocoanut, *d*	1.4410	.8736-.925	8.0-9.5	
	Peanut, *e*	1.4540	.911-.922	85.6-1905.	
	Walnut, *f*	1.480	.925-.928	143.-151.7	

a Extracted by ether.
b Extracted by pressure alone.
c Lewkowitsch. Oils, Fats and Waxes, p. 396.
d Ibid., p. 539.
e Ibid., p. 443.
f Ibid., p. 351.

TESTING GRASS SEED.

CHAS. D. WOODS.

The Legislature of 1897 entcted a law entitled "An Act to regulate the sale of agricultural seeds." This act makes it the duty of the Director of the Station to prescribe the methods to be used in examining seeds, and to "publish equitable standards of purity together with such other information concerning agricultural seeds as may be of public benefit."

The standards and methods of analysis were published as Bulletin 36 of this Station, copies of which can still be had on application.

Since the enactment of the seed law in Maine quite a number of samples (chiefly grass seeds) have been received by the Station for examination. Five grams of all the seeds submitted (excepting redtop of which only two grams were inspected) were examined. The inert matter and foreign seeds were separated by hand and then the foreign seeds classified into harmful and noxious. The inert matter and foreign seeds were weighed and the per cent calculated. The weed seeds were usually counted so as to give the number in a pound and the names of the weeds determined by comparison with sets of named seeds.

The samples of seeds received in 1898 were reported on pages 60-62 of the Report of the Station for that year. The samples examined in 1899 are here reported.

The inert matter consisted of sand, fragments of stems and leaves, chaff, whole insects, fragments of insects and insect excreta. The harmless foreign seed consisted mostly of redtop and clover in timothy, timothy, red top and clover in alsike and timothy and clover in redtop. Most of the samples examined came from outside the State and were purchased to sell as seed.

The kinds and amount of weed seeds found in the samples examined leads to the belief that seed for planting is not the only source of weeds in the State. A good many of the weed seeds found in the samples would not grow. An examination of whole grain brought in by the car-load and distributed in the State shows that it frequently carries many weed seeds. Interstate and State commerce where packing material is used are also important sources of weeds.

It will be noticed from the appended tables that the per cent of purity of seeds was for the most part high and that a large number of samples contained no weed seeds or only those that were not pernicious.

It is impossible to get a correct idea of the average per cent of purity of seed sold in the State from samples sent for examination, as one sample may represent only a few bags and another a car-load. A statement of the per cent of purity of a seed gives but little idea of its nature, as the impurities may be large and consist of harmless seeds or indifferent weeds, while one showing a low per cent of impurities may contain the vilest weed seeds.

The tables showing the results of the analyses of samples of seeds follow.

TABLE SHOWING THE RESULTS OF SEED ANALYSES INCLUDING PERCENTAGES OF PURITY, TOTAL IMPURITIES, INERT MATTER, FOREIGN AND WEED SEEDS.

Common Name.	Number of samples examined.	Samples free from inert matter.	Samples free from foreign seeds.	Samples free from weed seeds.	Highest per cent of purity.	Lowest per cent of purity.	Average per cent of purity.	Highest per cent of impurity.	Lowest per cent of impurity.	Average per cent of impurity.	Per cent of weed seeds.	Per cent of inert matter.
Red Clover	24	1	2	2	100.0	96.3	99.67	3.7	......	.33	.48	.24
Alsike	17	2	....	4	99.9	96.2	98.87	4.0	.1	1.13	1.34	.36
Timothy	38	3	8	10	100.0	97.9	99.26	2.1	.....	.74	.29	.53
Redtop	14	....	6	6	99.8	90.66	96.51	9.33	.3	3.49	.92	2.58
Orchard Grass	2	....	....	....	97.90	97.72	97.81	2.28	2.10	2.19	.46	1.73
Kentucky Bluegrass	1	....	....	....	98.2	98.2	98.2	1.8	1.8	1.8	.35	1.45
Hungarian Grass....	4	....	1	1	99.84	98.5	99.31	1.5	.16	.69	.42	.27
Wheat	1	1	1	1	100.0	100.0	100.0	......	......	......	.....	.....
Lawn Grass Mixture	2	....	....	...	97.20	83.70	90.45	16.3	2.8	9.55	.4	1.41

TABLE SHOWING THE KIND OF WEED SEEDS FOUND IN SAMPLES OF SEEDS EXAMINED.

Common Name.	Technical Name.	Name of Samples Examined and Number.								
		Red clover.	Alsike.	Timothy.	Redtop.	Orchard grass.	Kentucky bluegrass.	Hungarian grass.	Wheat.	Lawn grass mixture.
		24	17	38	14	2	1	4	1	2
Hedge Mustard	Sisymbrium officinale	....	1	3	....	....	....	....	....	....
Black Mustard	Brassica nigra	1	....	1	....	....	....	....	....	....
Shepherd's Purse	Capsella bursa-pastoris	1	2	9	1	....	....	....	....	....
Wild Peppergrass	Lepidium virginicum	....	5	9	1	1	....	....	....	....
Chickweed	Stellaria media	....	....	....	1	....	....	....	....	....
Evening Primrose	Œnothera biennis	....	1	16	....	....	....	....	....	....
Five-Finger — Cinque Foil	Potentilla monspeliensis	....	1	18	2	....	....	....	....	....
Cone Flower—Yellow Daisy	Rudbeckia hirta	....	1	24	3	....	....	....	....	1
May Weed	Anthemis cotula	1	2	1	1	....	....	1	....	....
Roman Wormwood	Ambrosia artemesiæfolia	1	....	....	....	....	....	1	....	....
Blue Verbena	Verbena hastata	....	....	16	2	....	1	2	....	....
Catnip	Nepeta-cataria	....	1	....	....	....	....	....	....	....
Heal All	Brunella vulgaris	2	....	....	....	....	....	....	....	....
Dooryard Plantain	Plantago major	1	2	3	....	....	....	....	....	....
Rugel's Plantain	Plantago rugellii	15	4	17	6	....	....	1	....	....
English Plantain	Plantago lanceolata	11	1	2	....	....	....	....	....	....
Awned Plantain	Plantago aristata	6	....	1	....	....	....	....	....	....
Prostrate Pigweed	Amaranthus flitoides	2	....	....	....	....	....	....	....	....
Rough Pigweed	Amaranthus retroflexus	3	3	3	....	....	....	2	....	....
Goosefoot	Chenopodium album	7	7	23	....	....	....	1	....	....
Sorrel	Rumex acetosella	12	14	5	4	....	....	....	....	2
Pennsylvania Smartweed	Polygonum Pennsylvanicum	19	1	....	1	1	....	2	....	1
Lady's Thumb	Polygonum persicaria	4	....	1	....	....	....	1	....	....
Black Bindweed	Polygonum convolvulus	1	....	1	1	1	....	1	....	....
Yellow Foxtail	Setaria glauca	20	4	....	....	....	....	2	....	....
Green Foxtail	Setaria viridis	2	1	1	....	....	....	....	....	....
Willow Leaved Dock	Rumex salicifolia	5	3	....	....	....	....	....	....	....
Curled Dock	Rumex crispus	....	....	1	....	....	....	....	....	....
Tall Buttercup	Ranunculus acris	....	....	....	....	....	....	....	....	1
Catchfly	Silene	....	1	....	....	....	....	....	....	....
Common Chickweed	Stellaria media	1	3	....	....	....	....	....	....	1
Clustered Dock	Rumex conglomeratus	1	1	....	....	....	....	....	....	....
Sprouting Crab-grass	Panicum proliferum græcizan	1	....	....	....	....	....	1	....	....
Tumble-weed	Amaranthus	....	....	....	....	....	....	....	....	....

POTATO POMACE.

J. M. Bartlett.

Potato pomace is the residue which is left in the manufacture of starch from potatoes. This material contains nearly all the fiber, protein, fat and a large part of the starch found in the fresh potato.

As it comes from the factory it is necessarily incorporated with a large amount of water through the method of manufacture. The process in general use in this country and Europe is briefly stated as follows:

The tubers after being thoroughly cleansed of all dirt are placed in iron grinding cylinders with saw teeth which lacerate the cells, setting the starch granules free. The ground mass is then washed with cold water on sieves placed over tanks, the starch granules passing through and settling out in the bottom of the tank while the pulp passes off with another portion of the wash water. As this pulp residue all goes to waste in this country the process is necessarily a wasteful one, and manufacturers have been giving some thought to devising a method of recovering it. The chief obstacle to its use in the fresh condition is the large amount of water it contains. If some method could be devised for cheaply removing the larger part of the water, the dry matter would have considerable value as a feeding stuff. Of course, the material could be fed with 80 to 90 per cent of water present, but in this condition it would keep but a short time, and as the period for manufacturing starch extends over but a few weeks of the year it would be available for only a very limited time for food; dried, however, it would keep any length of time.

In Europe the potato and beet residues from the manufacture of alcohol are quite extensively used as feeds in the wet condition, 80 to 125 pounds being fed to cattle daily per head. This material probably does not vary greatly in composition from the starch factory residue, but the manufacturing is conducted on a small scale, usually by the farmers themselves, and extends over quite a long period so this pomace can be conveniently fed out in the wet state.

Two samples of potato pomace have been sent to the Experiment Station for analysis to determine their value. One was from a New Sweden factory and the other from Houlton. The results of the analysis are given in the following tables:

TOTAL FEED NUTRIENTS IN POTATO POMACE.

	Fresh Material.						Water-Free.				
	Water.	Ash.	Protein.	Fiber.	N-free extract.	Fat.	Ash.	Protein.	Fiber.	N-free extract.	Fat.
New Sweden Sample.....	88.36	.36	.970	1.35	8.990	.070	3.02	7.36	11.52	77.52	.58
Houlton Sample.....	95.11	.16	.40	.55	3.75	.04	3.19	8.16	11.26	76.60	.79

TOTAL FERTILIZING ELEMENTS IN POTATO POMACE.

Fresh Material.				Water-Free.		
Water.	Nitrogen.	Phosphoric acid.	Potash.	Nitrogen.	Phosphoric acid.	Potash.
88.36	.117	.029	.115	1.18	.25	.97
95.11	.064	.013	.071	1.31	.26	1.46

FERTILIZER INSPECTION.

CHAS. D. WOODS, Director.

J. M. BARTLETT, Chemist in charge of Fertilizer Analysis.

The law regulating the sale of commercial fertilizers in this State calls for two bulletins each year. The first of these contains the analyses of the samples received from the manufacturer, guaranteed to represent, within reasonable limits, the goods to be placed upon the market later. The second bulletin contains the analyses of the samples collected in the open market by a representative of the Station.

The analyses of the manufacturer's samples for this year were published early in March. The present bulletin contains the analyses of the Station samples and of such of the manufacturer's samples as were received after Bulletin 50 was issued.

The Guaranteed Analysis.

The law requires that there shall be affixed to each package of fertilizer offered for sale in the State, "a plainly printed statement clearly and truly certifying the number of net pounds in the package sold or offered for sale, the name or trade mark under which the article is sold, the name of the manufacturer or shipper, the place of manufacture, the place of business and a chemical analysis stating the percentage of nitrogen, or its equivalent in ammonia in available form, of potash soluble in water, and of phosphoric acid in available form, soluble and reverted, as well as the total phosphoric acid, and the law directs that there shall be filed annually with the Director of the Maine Agricultural Experiment Station a *certified* copy of the above statement. Very soon after Bulletin 60, containing the analyses of the manufacturers' samples, was distributed a correspondent called our attention to the fact that, in the case of one prominent brand, there was considerable discrepancy between the guarantee published by the Station and that printed on the package. The correspondent also sent us printed matter in which a still different claim was made by the manufacturer as to the composition of the goods in question. To see if this was at all common, the inspector was instructed to take an exact copy of all guaranteed analyses found on the packages sampled. As a result it was found that 70 different brands carried, in the case of at least one of the ingredients, a different statement on the bag from the certified statement filed with the Station. Some of these cases may be explained by the goods being last year's goods. We analyzed no fertilizers that the manufacturers' agents *said* were last year's goods. In about one-third of the cases the figures on the packages are lower (but only slightly lower) than the certified guarantees. In a few instances the manufacturers make no claim on the package for phosphoric acid called for by their certificate. The tankage of the Portland Rendering Company carried no guaranteed analysis on the package. In the other cases the guarantee on the package is larger and frequently much larger than the certified copy.

The tables on pages 128-131 gives the minimum certified guaranteed analysis; the minimum guarantee on the package and the percentages found in the sample collected by the Station. The figures under the head of "found" are those showing the actual composition of the samples.

The Results of the Analyses.

The tables on pages 120 to 127 contain the results of the analyses of the samples collected by the inspector from goods in the open market. The figures which were given as the percentages of valuable ingredients guaranteed by the manufacturers are the minimum percentages of the certified guarantee. If, for instance, the guarantee is 2 to 3 per cent. of nitrogen, it is evident that the dealer cannot be held to have agreed to furnish more than 2 per cent., and so this percentage is taken as actual guarantee. The figures under the head of "found" are those showing the actual composition of the samples. Whenever the sample examined contains less than the guaranteed percentage of any ingredient the deficiency is indicated in the table by a †.

A comparison of the results of the analyses of the samples collected by the Station with the percentages guaranteed by the manufacturers shows, that many of the manufacturers do not intend to do much more than make good the minimum guarantee, and it is not surprising that this results in some of the goods falling below the guarantee in one or more ingredients. The table which follows gives the names of the goods and the ingredients in which they are deficient. No brand is included in this list unless it falls short at least one-tenth in one or more of its ingredients.

A LIST OF FERTILIZERS SOLD IN MAINE IN 1900 THE OFFICIALLY COLLECTED SAMPLES OF WHICH CONTAINED LESS THAN NINE TENTHS OF THE GUARANTEED AMOUNTS OF ONE OR MORE OF THE FERTILIZING CONSTITUENTS.

Station number.	Kind of Fertilizer	Deficient in
2408	Blanchard's Fish, Bone and Potash	Total phosphoric acid.
2409	Blanchard's Grass and Grain Fertilizer	Nitrogen and potash.
2410	Blanchard's Ground Fish Scrap	Potash.
2427	Stockbridge Potato and Vegetable Manure	Nitrogen.
2428	Stockbridge Seeding Down Manure	Nitrogen.
2477	Swift's Lowell Ground Bone	Nitrogen.
2506	Philbrick's Fertilizer	Nitrogen.
2508	Provincial Chemical Fertilizer Co.'s Potato Phosphate	Potash.
2518	Read's Sure Catch Fertilizer	Available and total phosphoric acid.
2520	Read's Sampson Fertilizer	Available phosphoric acid
2531	Sagadahoc Special Potato Fertilizer (sampled at Bangor)	Nitrogen.
2533	Yankee Fertilizer	Total phosphoric acid and nitrogen.
2551	Crocker's Potato, Hop and Tobacco Phosphate	Nitrogen.
2556	Sagadahoc Special Potato Fertilizer (sampled at Bowdoinham)	Nitrogen.
2557	Sagadahoc Superphosphate	Nitrogen.

While the number of brands which are considerably below their guarantee in one or more ingredients is quite large, (15), it is less than last year and there is little reason for thinking that there is intention to defraud. It frequently happens that a fertilizer which is below in one ingredient is considerably above in others. While this frees the manufacturer from suspicion of attempting to defraud, it is, nevertheless, a serious defect in the fertilizer. It is not enough that a fertilizer contains an equivalent amount of some other kind of plant food. When the purchaser pays for fifty pounds of nitrogen he is not rightly treated if the manufacturer gives him thirty pounds of nitrogen, even though he gives him enough more of potash or phosphoric acid to make a financial equivalent.

DESCRIPTIVE LIST OF STATION SAMPLES, 1900.

Station number.	Manufacturer, place of business and brand.	Sampled at
	HIRAM BLANCHARD, EASTPORT, ME.	
2408	Blanchard's Fish, Bone and Potash	Houlton
2409	Blanchard's Grass and Grain Fertilizer	Eastport
2410	Blanchard's Ground Fish Scrap	Eastport
	THE BOWKER FERTILIZER CO., BOSTON, MASS.	
2411	Bowker's Corn Phosphate	Bangor
2412	Bowker's Early Potato Manure	Houlton
2413	Bowker's Farm and Garden Phosphate	Portland
2414	Bowker's Fresh Ground Bone	Portland
2415	Bowker's Hill and Drill Phosphate	Bangor
2416	Bowker's Potash Bone	Belfast
2417	Bowker's Potato and Vegetable Fertilizer	Bangor
2418	Bowker's Potato and Vegetable Phosphate	Belfast
2419	Bowker's Six Per Cent Potato Fertilizer	Houlton
2420	Bowker's Square Brand Bone and Potash	Portland
2421	Bowker's Staple Phosphate or Three Per Cent Fertilizer	Bangor
2422	Bowker's Sure Crop Phosphate	Portland
2423	Bowker's Ten Per Cent Manure	Houlton
2424	Gloucester Fish and Potash	Bangor
2425	Stockbridge Corn and Grain Manure	Portland
2426	Stockbridge Pea and Bean Manure	Bangor
2427	Stockbridge Potato and Vegetable Manure	Portland
2545	Stockbridge Potato and Vegetable Manure	Bangor
2428	Stockbridge Seeding Down Manure	Bangor
	BRADLEY FERTILIZER CO., BOSTON, MASS.	
2429	Bradley's Complete Manure for Potatoes and Vegetables	Houlton
2546	Bradley's Complete Manure for Potatoes and Vegetables	Caribou
2430	Bradley's Corn Phosphate	Portland
2547	Bradley's Corn Phosphate	Bangor
2431	Bradley's Eureka Fertilizer	Bangor
2432	Bradley's Niagara Phosphate	Bangor
2433	Bradley's Potato Fertilizer	Belfast
2548	Bradley's Potato Fertilizer	Portland
2434	Bradley's Potato Manure	Houlton
2435	Bradley's X. L. Superphosphate	Bangor
	CLARK'S COVE FERTILIZER CO., BOSTON, MASS.	
2436	Bay State Fertilizer	Portland
2437	Bay State Fertilizer, G. G.	Bangor
2438	Bay State Fertilizer for Seeding Down	Bangor
2439	Defiance Phosphate	Bangor
2440	King Philip Alkaline Guano	Portland
	CLEVELAND DRYER CO., BOSTON, MASS.	
2441	Cleveland Fertilizer for All Crops	Bangor
2442	Cleveland Potato Phosphate	Portland
2443	Cleveland Seeding Down Fertilizer	Bangor
2444	Cleveland Superphosphate	Portland
	E. FRANK COE CO., NEW YORK, N. Y.	
2445	E. Frank Coe's Celebrated Special Grass and Grain Fertilizer,	Bangor
2446	E. Frank Coe's Columbian Corn Fertilizer	Portland
2447	E. Frank Coe's Columbian Potato Fertilizer	Bangor

ANALYSES OF STATION SAMPLES, 1900.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
2408	1.32	2.08	3.40	3.00	......	3.22	.31	3.22	3.00	3.53	4.00	3.15	3.00
2409	1.10	2.70	†3.80	4.47	......	3.41	.65	3.41	3.00	4.06	4.28	†1 30	2.00
2410	1.14	2.54	†3.68	4.00	......	3.65	.53	3.65	3.00	4.18	4.00	†.89	1.00
2411	.43	1.20	1.63	1.60	4.19	4.13	1.90	8.32	7.00	10.22	9.00	2.49	2.00
2412	2.41	.78	3.19	3.00	5.70	2.10	2.17	7.80	7.00	9.97	9.00	7.58	7.00
2413	.54	1.12	1.66	1.50	6.15	3.59	2.45	9.74	8.00	12.19	10.00	2.26	2.00
2414	.42	2.26	2.68	2.25	......	......	......	.....	.....	24.10	24.00	......	.....
2415	1.18	1.08	2.26	2.25	4.94	3.96	2.58	†8.90	9.00	11.48	12.00	2.30	2.00
2416	.15	.66	.81	.75	1.14	6.58	2.71	7.72	6.00	10.43	8.00	2.57	2.00
2417	.85	1.66	2.51	2.25	6.70	2.92	2.90	9.62	8.00	12.52	10.00	4.58	4.00
2418	.52	1.14	1.66	1.50	7.24	3.24	2.12	10.48	8.00	12.60	10.00	2.34	2.00
2419	.24	.68	.92	.75	5.14	3.92	1.80	9.06	7.00	10.86	10.00	6.18	6.00
2420	.51	1.34	1.85	1.50	1.85	4.80	5.60	6.65	6.00	12.25	12.00	2.51	2.00
2421	.22	.62	.84	.75	3.60	5.22	1.66	8.82	8.00	10.48	10.00	3.28	3.00
2422	.24	.72	.96	.75	5.83	3.86	2.39	9.69	9.00	12.08	11.00	2.05	2.00
2423	.20	.62	.82	.75	2.57	4.41	3.40	6.98	6.00	10.38	8.00	10.44	10.00
2424	.16	.68	.84	.75	5.26	5.03	2.04	10.29	6.00	12.33	9.00	1.35	1.00
2425	1.56	1.52	3.02	3.00	7.46	2.43	1.22	9.89	8.00	11.11	10.00	7.07	6.00
2426	.20	2.00	2.20	2.00	3.29	3.87	4.12	7.16	6.00	11.28	8.00	11.59	6.00
2427	1.20	1.64	†2.84	3.25	4.72	2.44	1.49	7.16	6.00	8.65	7.00	†9.92	10.00
2545	1.36	2.00	3.36	3.25	5.41	2.45	1.27	7.86	6.00	9.13	7.00	10.23	10.00
2428	.73	1.32	†2.05	2.50	3.47	4.54	2.69	8.01	6.00	10.70	10.00	10.22	10.00
2429	1.71	1.28	†2.99	3.30	5.41	3.44	1.50	8.85	8.00	10.35	9.00	7.10	7.00
2546	1.54	1.58	†3.12	3.30	5.29	3.26	1.80	8.55	8.00	10.35	9.00	7.71	7.00
2430	.94	1.15	2.08	2.06	5.70	3.45	2.31	9.15	8.00	11.46	10.00	1.89	1.50
2547	.52	1.78	2.30	2.06	6.13	3.54	2.34	9.67	8.00	12.01	10.00	2.02	1.50
2431	.22	.98	1.20	1.03	5.63	2.55	1.77	8.18	8.00	9.95	9.00	2.25	2.00
2432	.01	1.14	1.15	.82	3.22	5.09	1.69	8.31	7.00	10.00	8.00	1 35	1.08
2433	.72	1.36	2.08	2.06	6.44	2.71	1.54	9.15	8.00	10.69	10.00	3.17	3.00
2548	.97	1.15	2.12	2.06	5.94	2.71	1.97	8.65	8.00	10.62	10.00	3.18	3.00
2434	.91	1.60	2.51	2.50	4.36	2.12	2.16	6.48	6.00	8.64	8.00	5.58	5.00
2435	.95	1.56	2.51	2.50	6.73	2.99	2 10	9.72	9.00	11.82	11.00	2.32	2.00
2436	1.44	1.06	2.50	2.47	6.09	3.01	1.99	9.10	9.00	11.09	10.00	2.30	2.00
2437	.61	1.56	2.17	2.06	5.36	4.29	2.43	9.65	8.00	12.08	9.00	2.08	1.50
2438	.27	.86	1.13	1.03	5.55	3.55	1.75	9.10	8.00	10.85	10.00	2.47	2.00
2439	.43	.86	1.29	.82	4.22	4.86	2.37	9.08	7.00	11.45	9.00	1.80	1.00
2440	.32	.88	1.20	1.03	4.78	3.71	2.89	8.49	8.00	13.38	9.00	2.16	2.00
2441	.41	.74	1.15	1.03	5.53	3.84	1.28	9.37	8.00	10.65	9.00	2.29	2.00
2442	1.06	1.18	2.24	2.05	5.66	2.86	2.00	8.52	8.00	10.52	10.00	3.29	3.00
2443	.35	.88	1.23	1.03	4.88	3.77	1.66	8.65	8.00	10.31	9.00	2.39	2.00
2444	.97	1.10	2.07	2.03	6.20	2.48	2.30	8.68	8.00	10.98	9.00	1.87	1.50
2445	.44	.64	1.08	.80	7.06	2.90	2.44	9.96	8.50	12.40	10.00	2.08	1.25
2446	.71	.48	†1.19	1.20	5.40	3.66	3.29	9.06	8.50	12.35	9.50	2.55	2.50
2447	.72	.70	1.42	1.20	5.80	3.44	2.51	9.24	8.50	11.75	10.00	*2.81	2.50

* Potash largely sulphate. †Below guarantee.

DESCRIPTIVE LIST OF STATION SAMPLES, 1900.

Station number.	Manufacturer, place of business and brand.	Sampled at
2448	E. Frank Coe's Excelsior Potato Fertilizer	Portland
2549	E. Frank Coe's Excelsior Potato Fertilizer	Bangor
2449	E. Frank Coe's High Grade Ammoniated Bone Superphosphate	Portland
2450	E. Frank Coe's High Grade Potato Fertilizer	Bangor
2451	E. Frank Coe's New Englander Corn Fertilizer	Portland
2452	E. Frank Coe's New Englander Potato Fertilizer	Bangor
2453	E. Frank Coe's Prize Brand Grain and Grass Fertilizer	Portland
2454	E. Frank Coe's Red Brand Excelsior Guano	Portland
2455	E. Frank Coe's Special Potato Fertilizer	Bangor
2550	E. Frank Coe's Special Potato Fertilizer	Portland
2456	E. Frank Coe's Standard Grade Am'd Bone Superphosphate	Bangor
	CROCKER FERT. & CHEM. CO., BUFFALO, N. Y.	
2457	Crocker's Ammoniated Corn Phosphate	Belfast
2458	Crocker's Grass and Oats Fertilizer	Bangor
2459	Crocker's New Rival Ammoniated Superphosphate	Belfast
2460	Crocker's Potato, Hop and Tobacco Phosphate	Bangor
2551	Crocker's Potato, Hop and Tobacco Phosphate	Belfast
2461	Crocker's Superior Fertilizer	Bangor
	CUMBERLAND BONE PHOS. CO., PORTLAND, ME.	
2462	Cumberland Potato Fertilizer	Portland
2552	Cumberland Potato Fertilizer	Bangor
2463	Cumberland Seeding Down Manure	Bangor
2464	Cumberland Superphosphate	Bangor
	L. B. DARLING FERTILIZER CO., PAWTUCKET, R. I.	
2465	Darling's Blood, Bone and Potash	Houlton
	HENRY ELWELL & CO., NEW YORK, N. Y.	
2466	Elwell's Excelsior Potato Guano	Presque Isle
	GREAT EASTERN FERTILIZER CO., RUTLAND, VT.	
2467	Great Eastern Dissolved Bone	Bangor
2468	Great Eastern General Fertilizer	Bangor
2469	Great Eastern Grass and Oats Fertilizer	Belfast
2470	Great Eastern High Grade Potato Manure	Caribou
2471	Great Eastern Northern Corn Special	Belfast
2472	Great Eastern Potato Manure	Bangor
2553	Great Eastern Potato Manure	Belfast
	LISTER'S AGRICUL. CHEM. WORKS, NEWARK, N. J.	
2480	Lister's High Grade Special for Spring Crops	Portland
2481	Lister's Seeding Down Fertilizer	Portland
2482	Lister's Special Potato Fertilizer	Bangor
2554	Lister's Special Potato Fertilizer	Portland
2483	Lister's Success Fertilizer	Bangor
2484	Lister's U. S. Superphosphate	Bangor
	LOWELL FERTILIZER CO., BOSTON, MASS.	
2473	Swift's Lowell Animal Fertilizer	Bangor
2474	Swift's Lowell Bone Fertilizer	Portland
2475	Swift's Lowell Dissolved Bone and Potash	Bangor
2476	Swift's Lowell Fruit and Vine Fertilizer	Portland
2477	Swift's Lowell Ground Bone	Bangor
2478	Swift's Lowell Potato Manure	Portland
2479	Swift's Lowell Potato Phosphate	Portland

ANALYSES OF STATION SAMPLES, 1900.

Station Number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total. Found.	Total. Guaranteed.	Soluble.	Reverted.	Insoluble.	Available. Found.	Available. Guaranteed.	Total. Found.	Total. Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
2448	1.57	1.54	3.11	2.40	5.69	1.71	2.20	7.40	7.00	9.60	9.00	†*7.55	8.00
2549	1.48	1.02	2.50	2.40	6.00	2.04	2.50	8.04	7.00	10.54	9.00	†*7.59	8.00
2449	.97	1.00	1.97	1.85	6.86	1.82	1.80	†8.68	9.00	10.48	11.00	2.72	2.50
2450	1.32	1.14	2.46	2.40	5.75	2.24	2.13	7.99	7.00	10.12	9.00	*6.70	6.50
2451	.50	.46	.96	.80	4.84	3.60	3.07	8.44	7.50	11.51	8.00	3.18	3.00
2452	.35	.68	1.03	.80	5.97	3.10	1.61	9.07	7.50	10.68	8.00	3.61	3.00
2453	......	.....	......	.....	6.76	3.60	3.35	†10.36	10.50	13.71	12.00	2.26	2.00
2454	2.45	.98	3.43	3.40	6.41	2.15	1.93	†8.56	9.00	10.49	10.00	*6.31	6.00
2455	1.24	.54	1.78	1.60	6.61	2.08	2.17	8.69	8.00	10.86	10.00	†*3.79	4.00
2550	.88	.90	1.78	1.60	6.62	1.97	1.97	8.59	8.00	10.56	10.00	†*3.89	4.00
2456	.13	1.24	1.37	1.20	6.96	2.93	2.70	9.89	8.00	12.59	10.00	2.66	2.25
2457	1.51	.64	2.15	2.05	6.78	2.27	1.55	9.05	8.00	10.60	9.00	2.00	1.50
2458	......	.....	......	......	6.91	3.38	1.38	†10.29	11.00	11.67	12.00	2.11	2.00
2459	.07	.96	1.03	1.03	6.47	3.17	2.24	9.64	8.00	11.88	9.00	2.06	2.00
2460	1.08	.90	†1.98	2.05	6.27	2.76	1.72	9.03	8.00	10.75	9.00	3.26	3.25
2551	.67	1.14	†1.81	2.05	6.42	2.57	2.17	8.99	8.00	11.16	10.00	3.42	3.25
2461	.02	.98	1.00	.82	3.93	3.82	2.01	†7.75	8.00	9.76	9.00	†1.82	2.00
2462	1.13	.78	†1 91	2.06	6.18	2.56	1.68	8.74	8.00	10.42	9.00	3.17	3.00
2552	1.12	1.12	2.24	2.06	6.09	3.12	2.34	9.21	8.00	11.55	9.00	3.15	3.00
2463	......	1.24	1.24	1.03	6.85	1.84	1.62	8.69	8.00	10.31	10.00	2.27	2.00
2464	......	2.14	2.14	2.06	4.85	4.20	2.33	9.05	8.00	11.38	9.00	2.32	1.50
2465	3.18	.60	†3.78	4.10	4.59	3.58	1.39	8 17	7.00	9.56	8.00	7.24	7.00
2466	2.12	.54	†2.66	2.88	4.34	1.79	.35	6.13	5.50	6.48	......	10.68	10.00
2467	......	......	......	......	8.48	4.67	.93	†13.15	14.00	14.08	14.00	......	.....
2468	.02	1.00	1.02	.82	4.73	4.18	2.63	8.91	8.00	11.54	8.00	†3.71	4.00
2469	.....	.....	......	......	6.54	3.63	1.81	†10.17	11.00	11.98	11.00	†1.97	2.00
2470	2.13	1.12	*3.25	3.29	3.70	3.28	2.12	6.98	6.00	9.10	7.00	†9.58	10.00
2471	1.16	.96	2.12	2.06	6.06	2.98	1.86	9.04	8.00	10.90	8.00	1.51	1.50
2472	.74	1.20	†1.94	2.06	5.94	2.87	1.95	8.81	8.00	10.76	8.00	3.38	3.25
2553	1.08	.92	†2.00	2.06	6.17	2.71	2.38	8.88	8.00	11.26	8.00	†3.14	3.25
2480	.80	1.08	1.88	1.85	5.24	3.22	3.11	†8.46	8.50	11.57	10.00	10.02	10.00
2481	.43	.38	.81	.62	8.29	3.85	1.11	12.14	10.00	13.25	11.00	1.05	1.00
2482	.87	.82	1.69	1.65	4.57	3.87	3.23	8.44	8.00	11.67	9.00	†2.90	3.00
2554	.64	1.20	1.84	1.65	4.85	4.60	3.18	9.45	8.00	12.63	9.00	3.06	3.00
2483	.58	.86	1.44	1.24	6.59	3.30	1.93	9.89	9.50	11.82	11.50	8.10	2.00
2484	.12	1.30	1.42	1.32	3.03	4.72	3.04	7.75	7.00	10.79	8.00	2.37	2.00
2473	1.52	1.12	2.64	2.46	3.55	6.09	1.86	9.64	9.00	11.50	10.00	4.13	4.00
2474	.79	.96	1.75	1.64	4.36	3.71	2.87	8.07	8.00	10.94	9.00	3.35	3.00
2475	.20	1.68	1.88	1.64	6.01	3.40	1 93	9.41	9.00	11.34	10.00	2.39	2.00
2476	1.73	1.46	†3.19	3.29	5.43	3.56	1.03	8.99	7.00	10.02	8.00	6.48	6.00
2477	.48	1.56	†2.04	2.46	.....	......	.....	......	......	28.76	22.90	.....	......
2478	.14	1.70	1.84	1.64	3.92	3.07	2.94	†6.99	7.00	9.93	8.00	*4.01	4.00
2479	1.28	1.26	2.54	2.46	4.72	3.55	3.10	8.27	8.00	11.37	9.00	*7.03	6.00

* Potash largely sulphate. † Below guarantee.

DESCRIPTIVE LIST OF STATION SAMPLES, 1900.

Station number.	Manufacturer, place of business and brand.	Sampled at
	NATIONAL FERTILIZER CO., BRIDGEPORT, CONN.	
2485	Chittenden's Ammoniated Bone Phosphate	Presque Isle
2486	Chittenden's Complete Fertilizer	Fort Fairfield
2487	Chittenden's Market Garden Fertilizer	Presque Isle
	NEW ENGLAND FERTILIZER CO., BOSTON, MASS.	
2488	New England Corn Phosphate	Bangor
2489	New England Potato Fertilizer.	Portland
2558	New England Potato Fertilizer.	Bangor
	S. G. OTIS, HALLOWELL, MAINE.	
2490	Otis Potato Fertilizer	Houlton
2491	Otis Seeding Down Fertilizer	Skowhegan
2492	Otis Superphosphate.	North Deering.
	PACIFIC GUANO CO., BOSTON, MASS.	
2493	Pacific Guano Co.'s Grass and Grain Fertilizer	Bangor
2494	Pacific Guano Co.'s Nobsque Guano	Portland
2495	Pacific Guano Co.'s Potato Special.	Bangor
2496	Pacific Guano Co.'s Soluble Pacific Guano	Portland
	PACKERS' UNION FERTILIZER CO., NEW YORK, N. Y.	
2497	Packers' Union Animal Corn Fertilizer	Eddington
2498	Packers' Union Economical Vegetable Guano	Eddington
2499	Packers' Union High Grade Potato Manure	Eddington
2500	Packers' Union Universal Fertilizer	Eddington
2555	Packers' Union Universal Fertilizer	Bangor
2501	Packers' Union Wheat, Oats and Clover Fertilizer	Eddington
	PARMENTER & POLSEY FER. CO., PEABODY, MASS.	
2502	Parmenter & Polsey Fertilizer Co.'s Special Potato Fertilizer	Presque Isle
2503	Plymouth Rock Brand.	Caribou.
2504	P. and P. Potato Fertilizer	Presque Isle
2505	Star Brand Superphosphate	Augusta
	EDWIN J. PHILBRICK, AUGUSTA, MAINE.	
6	Philbrick's Fertilizer	Augusta
	PORTLAND RENDERING CO., PORTLAND, MAINE.	
07	Portland Rendering Co.'s Bone Tankage	East Deering
	PROVINCIAL CHEM. FER. CO., L't'd, ST. JOHN, N. B.	
2508	Provincial Chemical Fertilizer Co.'s Potato Phosphate	Presque Isle
	THE QUINNIPIAC CO., BOSTON, MASS.	
2509	Quinnipiac Climax Phosphate	Bangor
2510	Quinnipiac Corn Manure	Portland
2511	Quinnipiac Phosphate	Bangor
2512	Quinnipiac Potato Manure	Portland
2513	Quinnipiac Potato Phosphate	Bangor
2514	Quinnipiac Seeding Down Manure	Belfast
	READ FERTILIZER CO., NEW YORK, N. Y.	
2515	Read's Potato Manure	Caribou
2516	Read's Practical Potato Special	Bucksport
2517	Read's Standard Fertilizer	Bucksport
2518	Read's Sure Catch Fertilizer	Bucksport
2519	Read's Vegetable and Vine Fertilizer	Fort Fairfield
2520	Read's Sampson Fertilizer	Bucksport

ANALYSES OF STATION SAMPLES, 1900.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
2485	.66	1.46	2.12	1.65	3.34	6.47	1.97	9.81	8.00	11.78	10.00	2.25	2.00
2486	1.05	2.30	3.35	3.30	4.88	2.84	2.29	†7.72	8.00	10.01	10.00	6.14	6.00
2487	1.01	1.56	2.57	2.45	3.56	2.82	2.10	6.38	6.00	8.48	8.00	5.68	5.00
2488	.56	1.14	1.70	1.64	4.89	3.90	2.64	8.79	8.00	11.43	9.00	3.31	3.00
2489	.36	1.26	†1.62	1.64	4.55	2.83	3.00	7.38	7.00	10.38	8.00	*4.00	4.00
2558	.52	1.49	2.01	1.64	2.18	4.49	1.53	6.67	7.00	8.20	8.00	*4.47	4.00
2490	1.12	.94	2.06	2.06	5.63	2.91	2.17	8.54	8.00	10.71	10.00	3.16	3.00
2491	.62	.52	†1.14	1.25	5.57	2.66	2.50	8.23	8.00	10.73	10.00	2.40	2.00
2492	1.02	1.10	2.12	2.06	6.14	2.22	2.39	8.36	8.00	10.75	10.00	1.75	1.50
2493	.44	.80	1.24	.82	4.24	4.25	2.38	8.49	7.00	10.87	8.00	1.36	1.00
2494	.51	.72	1.23	1.03	4.62	3.81	3.33	8.43	8.00	11.76	9.00	2.22	2.00
2495	1.12	.96	2.08	2.05	5.89	3.11	2.50	9.00	8.00	11.50	9.00	†2.97	3.00
2496	1.17	.96	2.13	2.06	5.94	2.43	2.33	8.37	8.00	10.70	9.00	1.93	1.50
2497	1.22	1.40	2.62	2.47	6.62	3.41	1.78	10.03	9.00	11.81	10.00	2.36	2.00
2498	.51	.70	†1.21	1.25	5.64	3.14	2.69	8.78	6.00	11.47	7.00	3.25	3.00
2499	1.24	1.06	2.30	2.06	5.86	3.30	1.52	9.16	8.00	10.68	9.00	6.13	6.00
2500	.71	.42	1.13	.82	5.08	3.64	2.54	8.72	8.00	11.26	9.00	†3.67	4.00
2555	.57	.70	1.27	.82	4.81	3.71	2.78	8.52	8.00	11.30	9.00	†3.97	4.00
2501	.....	......	......	......	5.14	5.66	1.73	†10.80	11.00	12.53	12.00	2.14	2.00
2502	1.79	1.70	3.49	3.29	3.55	6.10	1.17	9.65	8.00	10.82	9.00	7.47	7.00
2503	1.44	1.46	2.90	2.47	2.81	6.49	1.88	9.30	8.00	11.18	9.00	5.11	4.00
2504	.79	1.18	1.97	1.64	4.00	3.94	1.42	7.94	6.00	9.36	7.00	†5.66	6.00
2505	.73	1.22	1.95	1.64	2.81	5.43	1.14	8.24	7.00	9.38	8.00	3.27	2.50
2506	.61	1.02	†1.63	2.00	3.22	4.40	2.40	7.62	7.00	10.02	9.00	6.34	5.00
2507	.88	3.96	4.84	4.54	.37	9.27	6.27	9.64	......	15.91	16.65	......	......
2508	2.33	.88	3.21	2.88	7.45	2.22	3.86	9.67	8.00	13.53	......	†4.76	6.50
2509	.37	1.10	1.47	1.03	5.34	3.91	1.83	9.25	8.00	11.08	9.00	2.58	2.00
2510	1.02	1.10	2.12	2.06	5.41	4.25	2.42	9.66	8.00	12.08	9.00	1.75	1.50
2511	.94	1.70	2.64	2.47	5.95	3.94	2.09	9.89	9.00	11.98	10.00	2.24	2.00
2512	1.31	1.18	2.49	2.47	4.20	4.10	.92	8.30	6.00	9.22	7.00	5.50	5.00
2513	1.00	1.18	2.18	2.05	4.86	5.38	1.48	10.24	8.00	11.72	9.00	3.20	3.00
2514	.20	1.06	1.26	1.03	5.42	2.55	2.44	†7.97	8.00	10.41	9.00	†1.97	2.00
2515	1.02	1.34	†2.36	2.47	3.44	3.91	1.47	7.35	6.00	8.82	7.00	10.60	10.00
2516	.16	.92	1.08	.83	2.45	3.66	.95	6.11	4.00	7.06	5.00	8.29	8.00
2517	.23	.86	1.09	.83	5.61	2.97	2.35	8.58	8.00	10.93	9.00	4.23	4.00
2518	......	......	......	......	2.41	4.20	1.64	†6.61	10.00	8.25	11.00	4.18	2.00
2519	.82	1.26	2.08	2.05	5.76	2.85	2.34	8.61	8.00	10.95	9.00	†5.85	6.00
2520	.42	1.44	†1.86	2.05	4.54	2.55	1.60	†7.09	8.00	8.69	9.00	4.61	3.00

* Potash largely sulphate. † Below guarantee.

DESCRIPTIVE LIST OF STATION SAMPLES, 1900.

Station number.	Manufacturer, place of business and brand.	Sampled at
	THE RUSSIA CEMENT CO., GLOUCESTER, MASS.	
2521	Essex Complete Manure for Corn, Grain and Grass	Bangor
2522	Essex Complete Manure for Potatoes, Roots and Vegetables	Bangor
2523	Essex Corn Fertilizer	Bangor
2524	Essex Potato Fertilizer	Bangor
2525	Essex XXX Fish and Potash	Bangor
2526	Maine State Grange Chemicals	Bowdoinham
2527	Maine State Grange Potato Manure	Bowdoinham
2528	Maine State Grange Seeding Down Fertilizer	Bowdoinham
	SAGADAHOC FERTILIZER CO., BOWDOINHAM, ME.	
2529	Dirigo Fertilizer	Bangor
2530	Merrymeeting Superphosphate	Bangor
2531	Sagadahoc Special Potato Fertilizer	Bangor
2556	Sagadahoc Special Potato Fertilizer	Bowdoinham
2532	Sagadahoc Superphosphate	Bangor
2557	Sagadahoc Superphosphate	Bowdoinham
2533	Yankee Fertilizer	Bangor
	STANDARD FERTILIZER CO., BOSTON, MASS.	
2534	Standard A Brand	Portland
2535	Standard Complete Manure	Bangor
2536	Standard Fertilizer	Portland
2537	Standard Guano	Bangor
2538	Standard Special for Potatoes	Bangor
	JOHN WATSON, HOULTON, MAINE.	
2539	Watson's Improved High Grade Potato Manure	Houlton
	WILLIAMS & CLARK FERTILIZER CO., BOSTON, MASS.	
2540	Americus Ammoniated Bone Superphosphate	Portland
2541	Americus Corn Phosphate	Bangor
2542	Americus Potato Manure	Portland
2543	Royal Bone Phosphate for All Crops	Bangor
2544	Williams & Clark Fertilizer Co.'s Potato Phosphate	Portland

ANALYSES OF STATION SAMPLES, 1900.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
2521	.94	2.90	3.84	3.70	2.88	5.59	2.43	8.47	7.00	10.90	9.50	10.11	9.50
2522	.54	3.42	3.96	3.70	3.19	4.96	2.88	8.15	7.00	11.03	9.00	*8.69	8.50
2523	.59	1.54	2.13	2.00	1.68	7.09	5.11	†8.77	9.00	13.88	10.50	3.41	3.00
2524	.47	1.56	2.03	2.00	2.45	6.51	4.52	†8.96	9.00	13.48	10.50	6.27	5.00
2525	.86	1.90	2.76	2.10	2.85	6.71	5.87	9.56	9.00	15.43	12.00	2.82	2.25
2526	1.14	1.70	2.84	2.50	2.91	6.44	4.60	9.35	8.00	13.95	12.00	5.44	4.00
2527	.90	.78	1.68	1.50	3.40	7.56	3.24	10.96	9.00	14.20	12.00	†11.16	12.00
2528	.16	1.44	1.60	1.50	1.52	5.34	7.17	†6.86	7.00	14.03	13.00	†5.47	5.50
2529	.18	1.40	1.58	1.50	1.39	4.73	3.80	6.12	3.50	9.92	9.00	4.23	3.75
2530	.83	.46	1.29	1.20	2.03	5.58	3.03	7.61	5.00	10.64	9.00	3.14	2.00
2531	.33	1.08	†1.41	2.40	5.69	3.59	.62	9.28	6.50	9.90	9.50	9.64	7.00
2556	.78	.68	†1.46	2.40	5.81	3.55	.64	9.36	6.50	10.00	9.50	9.73	7.00
2532	.94	.98	†1.92	2.05	2.85	5.64	2.51	8.49	6.50	11.00	10.00	4.21	4.00
2557	.84	.96	†1.80	2.05	3.77	5.30	2.08	9.07	6.50	11.15	10.00	4.60	4.00
2533	.56	.46	1.02	.40	1.27	3.93	.66	†5.20	5.50	5.86	7.00	4.90	1.50
2534	.50	.78	1.28	.82	2.99	4.98	3.42	7.97	7.00	11.39	9.00	1.58	1.00
2535	2.48	.86	3.34	3.30	4.00	4.30	1.91	8.30	8.00	10.21	9.00	7.15	7.00
2536	1.10	1.22	2.32	2.06	5.70	3.18	2.12	8.88	8.00	11.00	9.00	2.69	1.50
2537	.57	.66	1.23	1.03	4.56	3.85	2.28	8.41	8.00	10.69	9.00	2.33	2.00
2538	.94	1.26	2.20	2.05	5.69	3.79	2.12	9.48	8.00	11.60	9.00	3.14	3.00
2539	1.12	1.60	†2.72	3.00	.67	5.17	1.95	†5.84	6.00	7.79	7.00	†4.97	5.00
2540	1.38	1.20	2.58	2.47	5.67	4.00	1.90	9.67	9.00	11.57	10.00	2.49	2.00
2541	.62	1.58	2.20	2.06	5.89	3.55	2.05	9.44	8.00	11.49	9.00	1.94	1.50
2542	1.00	1.10	2.10	2.06	5.21	3.57	2.15	8.78	8.00	10.93	9.00	3.42	3.00
2543	.38	.72	1.10	1.03	5.80	3.62	1.84	9.42	8.00	11.26	9.00	2.63	2.00
2544	1.24	1.12	†2.36	2.47	3.82	2.32	2.53	6.14	6.00	8.67	7.00	5.94	5.00

* Potash largely sulphate. † Below guarantee.

DESCRIPTIVE LIST OF STATION SAMPLES, 1900, CARRYING ON THE PACKAGE A GUARANTEED ANALYSIS DIFFERING FROM THE CERTIFIED STATEMENT FILED WITH THE STATION DIRECTOR.

Station number.	Brand.	Sampled at
2408	Blanchard's Fish, Bone and Potash	Houlton
2409	Blanchard's Grass and Grain Fertilizer	Eastport
2410	Blanchard's Ground Fish Scrap	Eastport
2411	Bowker's Corn Phosphate	Bangor
2413	Bowker's Farm and Garden Phosphate	Portland
2415	Bowker's Hill and Drill Phosphate	Bangor
2417	Bowker's Potato and Vegetable Fertilizer	Bangor
2418	Bowker's Potato and Vegetable Phosphate	Belfast
2423	Bowker's Ten Per Cent Manure	Houlton
2425	Stockbridge Corn and Grain Manure	Portland
2426	Stockbridge Pea and Bean Manure	Bangor
2427	Stockbridge Potato and Vegetable Manure	Portland
2545	Stockbridge Potato and Vegetable Manure	Bangor
2428	Stockbridge Seeding Down Manure	Bangor
2432	Bradley's Niagara Phosphate	Bangor
2437	Bay State Fertilizer G. G	Bangor
2444	Cleveland Superphosphate	Portland
2445	E. Frank Coe's Celebrated Special Grass and Grain Fertilizer	Bangor
2446	E. Frank Coe's Columbian Corn Fertilizer	Portland
2447	E. Frank Coe's Columbian Potato Fertilizer	Bangor
2448	E. Frank Coe's Excelsior Potato Fertilizer	Portland
2449	E. Frank Coe's High Grade Ammoniated Bone Superphosphate	Portland
2450	E. Frank Coe's High Grade Potato Fertilizer	Bangor
2451	E. Frank Coe's New Englander Corn Fertilizer	Portland
2452	E. Frank Coe's New Englander Potato Fertilizer	Bangor
2453	E. Frank Coe's Prize Brand Grain and Grass Fertilizer	Portland
2454	E. Frank Coe's Red Brand Excelsior Guano	Portland
2455	E. Frank Coe's Special Potato Fertilizer	Bangor
2550	E. Frank Coe's Special Potato Fertilizer	Portland
2456	E. Frank Coe's Standard Grade Am'd Bone Superphosphate	Bangor
2457	Crocker's Ammoniated Corn Phosphate	Belfast
2460	Crocker's Potato, Hop and Tobacco Phosphate	Bangor
2551	Crocker's Potato, Hop and Tobacco Phosphate	Belfast
2462	Cumberland Potato Fertilizer	Portland
2552	Cumberland Potato Fertilizer	Bangor
2464	Cumberland Superphosphate	Bangor
2466	Elwell's Excelsior Potato Guano	Presque Isle
2467	Great Eastern Dissolved Bone	Bangor
2468	Great Eastern General Fertilizer	Bangor
2469	Great Eastern Grass and Oats Fertilizer	Belfast
2471	Great Eastern Northern Corn Special	Belfast
2472	Great Eastern Potato Manure	Bangor

ANALYSIS OF STATION SAMPLES, 1900, CARRYING ON THE PACKAGE A GUARANTEED ANALYSIS DIFFERING FROM THE CERTIFIED STATEMENT FILED WITH THE STATION DIRECTOR.

Station number.	Nitrogen.			Available Phosphoric Acid.			Total Phosphoric Acid.			Potash.		
	Found.	Guarantee on certificate.	Guarantee on bag.	Found.	Guarantee on certificate.	Guarantee on bag.	Found.	Guarantee on certificate.	Guarantee on bag.	Found.	Guarantee on certificate.	Guarantee on bag.
	%	%	%	%	%	%	%	%	%	%	%	%
2408	3.40	3.00	4.47	3.22	3.00	*	3.53	4.00	5.15	3.15	3.00	6.00
2409	3.80	4.47	4.47	3.41	3.00	*	4.06	4.28	5.15	1.30	2.00	3.00
2410	3.68	4.00	4.47	3.65	3.00	*	4.18	4.00	5.15	.89	1.00	*
2411	1.63	1.60	1.50	8.32	7.00	8.00	10.22	9.00	10.00	2.49	2.00	2.00
2413	1.66	1.50	1.50	9.74	8.00	9.00	12.19	10.00	11.00	2.26	2.00	2.00
2415	2.26	2.25	2.10	8.90	9.00	9.00	11.48	12.00	12.00	2.30	2.00	2.00
2417	2.51	2.25	2.25	9.62	8.00	9.00	12.52	10.00	11.00	4.58	4.00	4.00
2418	1.66	1.50	1.50	10.48	8.00	8.00	12.60	10.00	11.00	2.34	2.00	2.00
2423	.82	.75	.82	6.98	6.00	6.00	10.38	8.00	8.00	10.44	10.00	10.00
2425	3.02	3.00	3.00	9.89	8.00	7.00	11.11	10.00	10.00	7.07	6.00	6.00
2426	2.20	2.00	2.00	7.16	6.00	6.00	11.28	8.00	*	11.59	6.00	6.00
2427	2.84	3.25	3.20	7.16	6.00	6.00	8.65	7.00	8.00	9.92	10.00	10.00
2545	3.36	3.25	3.20	7.86	6.00	6.00	9.13	7.00	8.00	10.23	10.00	10.00
2428	2.05	2.50	2.25	8.01	6.00	8.00	10.70	10.00	10.00	10.22	10.00	10.00
2432	1.15	.82	.82	8.31	7.00	7.00	10.00	8.00	8.00	1.35	1.08	1.00
2437	2.17	2.06	1.85	9.65	8.00	8.50	12.08	9.00	10.00	2.08	1.50	2.00
2444	2.07	2.03	2.03	8.68	8.00	8.00	10.98	9.00	10.00	1.87	1.50	1.50
2445	1.08	.80	.80	9.96	8.50	9.00	12.40	*	10.00	2.08	1.25	1.25
2446	1.19	1.20	1.20	9.06	8.50	8.50	12.35	*	9.50	2.55	2.50	2.50
2447	1.42	1.20	1.20	9.24	8.50	8.00	11.75	*	10.00	2.81	2.50	2.50
2448	3.11	2.40	2.50	7.40	7.00	8.00	9.60	*	9.00	7.55	8.00	8.00
2449	1.97	1.85	1.85	8.68	9.00	9.00	10.48	*	11.00	2.72	2.25	2.25
2450	2.46	2.40	2.40	7.99	7.00	7.00	10.12	*	9.00	6.70	6.50	6.50
2451	.96	.80	.80	8.44	7.50	7.50	11.51	*	8.00	3.18	3.00	3.00
2452	1.03	.80	.80	9.07	7.50	7.00	10.68	*	8.00	3.61	3.00	3.00
2453	....	....	....	10.36	10.50	10.50	13.71	*	12.00	2.26	2.00	2.00
2454	3.43	3.40	3.50	8.56	9.00	9.00	10.49	*	10.00	6.31	6.00	6.25
2455	1.78	1.60	1.65	8.69	8.00	8.00	10.86	*	10.00	3.79	4.00	4.00
2550	1.78	1.60	1.50	8.59	8.00	8.00	10.56	10.00	10.50	3.89	4.00	4.00
2456	1.37	1.20	1.25	9.89	8.00	9.00	12.59	*	10.00	2.66	2.25	2.25
2457	2.15	2.05	2.05	9.05	8.00	8.00	10.60	9.00	10.00	2.00	1.50	1.50
2460	1.98	2.05	2.05	9.03	8.00	8.00	10.75	9.00	10.00	3.26	3.25	3.00
2551	1.81	2.05	2.05	8.99	8.00	8.00	11.16	10.00	10.00	3.42	3.25	3.00
2462	1.91	2.06	2.06	8.74	8.00	8.00	10.42	9.00	10.00	3.17	3.00	3.00
2552	2.24	2.06	2.06	9.21	8.00	9.00	11.55	9.00	11.00	3.15	3.00	3.00
2464	2.14	2.06	2.06	9.05	8.00	8.00	11.38	9.00	10.00	2.32	1.50	1.50
2466	2.66	2.88	2.88	6.13	5.50	5.50	6.48	*	*	10.68	10.00	10.00
2467	....	....	....	13.15	14.00	14.00	14.08	14.00	16.00	......	......	.....
2468	1.02	.82	.82	8.91	8.00	8.00	11.54	8.00	10.00	3.71	4.00	4.00
2469	....	....	....	10.17	11.00	11.00	11.98	11.00	12.00	1.97	2.00	2.00
2471	2.12	2.06	2.06	9.04	8.00	8.00	10.98	8.00	9.00	1.51	1.50	1.50
2472	1.94	2.06	2.00	8.81	8.00	8.00	10.76	8.00	10.00	3.38	3.25	3.00

* Not guaranteed.

DESCRIPTIVE LIST OF STATION SAMPLES, 1900, CARRYING ON THE PACKAGE A GUARANTEED ANALYSIS DIFFERING FROM THE CERTIFIED STATEMENT FILED WITH THE STATION DIRECTOR.

Station number.	Brand.	Sampled at
2553	Great Eastern Potato Manure	Belfast
2476	Swift's Lowell Fruit and Vine Fertilizer	Portland
2477	Swift's Lowell Ground Bone	Bangor
2485	Chittenden's Ammoniated Bone Phosphate	Presque Isle
2486	Chittenden's Complete Fertilizer	Fort Fairfield
2496	Pacific Guano Co.'s Soluble Pacific Guano	Portland
2506	Philbrick's Fertilizer	Augusta
2507	Portland Rendering Co.'s Bone Tankage	East Deering
2508	Provincial Chemical Fertilizer Co.'s Potato Phosphate	Presque Isle
2509	Quinnipiac Climax Phosphate	Bangor
2510	Quinnipiac Corn Manure	Portland
2518	Read's Sure Catch Fertilizer	Bucksport
2519	Read's Vegetable and Vine Fertilizer	Fort Fairfield
2520	Read's Sampson Fertilizer	Bucksport
2521	Essex Complete Manure for Corn, Grain and Grass	Bangor
2523	Essex Corn Fertilizer	Bangor
2524	Essex Potato Fertilizer	Bangor
2529	Dirigo Fertilizer	Bangor
2530	Merrymeeting Superphosphate	Bangor
2531	Sagadahoc Special Potato Fertilizer	Bangor
2556	Sagadahoc Special Potato Fertilizer	Bowdoinham
2532	Sagadahoc Superphosphate	Bangor
2557	Sagadahoc Superphosphate	Bowdoinham
2533	Yankee Fertilizer	Bangor
2536	Standard Fertilizer	Portland
2537	Standard Guano	Bangor
2541	Americus Corn Phosphate	Bangor
2543	Royal Bone Phosphate for All Crops	Bangor

ANALYSIS OF STATION SAMPLES, 1900, CARRYING ON THE PACKAGE A GUARANTEED ANALYSIS DIFFERING FROM THE CERTIFIED STATEMENT FILED WITH THE STATION DIRECTOR.

Station number.	Nitrogen.			Available Phosphoric Acid.			Total Phosphoric Acid.			Potash.		
	Found.	Guarantee on certificate.	Guarantee on bag.	Found.	Guarantee on certificate.	Guarantee on bag.	Found.	Guarantee on certificate.	Guarantee on bag.	Found.	Guarantee on certificate.	Guarantee on bag.
	%	%	%	%	%	%	%	%	%	%	%	%
2553	2.00	2.06	2.06	8.88	8.00	8.00	11.26	8.00	9.00	3.14	3.25	3.25
2476	3.19	3.29	2.47	8.99	7.00	8.00	10.62	8.00	9.00	6.48	6.00	6.00
2477	2.04	2.46	*	.....	5.00	*	28.76	22.90	*	.....	......	......
2485	2.12	1.65	1.85	9.81	8.00	7.00	11.78	10.00	9.00	2.25	2.00	2.00
2486	3.35	3.30	3.70	7.72	8.00	8.00	10.01	10.00	10.00	6.14	6.00	6.00
2496	2.13	2.06	2.06	8.37	8.00	8.00	10.70	9.00	10.00	1.93	1.50	1.50
2506	1.63	2.00	2.50	7.62	7.00	7.00	10.02	9.00	9.00	6.34	5.00	6.00
2507	4.84	4.54	*	9.64	*	*	15.91	16.65	*	......	....	.....
2508	3.21	2.88	3.09	9.67	8.00	8.00	13.53	*	*	4.76	6.50	6.50
2509	1.47	1.03	1.25	9.25	8.00	8.00	11.08	9.00	9.00	2.58	2.00	2.00
2510	2.12	2.06	2.06	9.66	8.00	8.00	12.08	9.00	10.00	1.75	1.50	1.50
2518	... .	....	....	6.61	10.00	6.00	8.25	11.00	7.00	4.18	2.00	4.00
2519	2.08	2.05	1.10	8.61	8.00	8.00	10.95	9.00	9.00	5.85	6.00	6.00
2520	1.86	2.05	1.65	7.09	8.00	6.00	8.69	9.00	7.00	4.61	3.00	4.00
2521	3.84	3.70	3.70	8.47	7.00	7.50	10.90	9.50	10.00	10.11	9.50	9.50
2523	2.13	2.00	2.00	8.77	9.00	9.00	13.88	10.50	11.00	3.41	3.00	3.00
2524	2.03	2.00	2.00	8.96	9.00	9.00	13.48	10.50	11.00	6.27	5.00	5.00
2529	1.58	1.50	2.00	6.12	3.50	*	9.92	9.00	9.00	4.23	3.75	4.50
2530	1.29	1.20	1.25	7.61	5.00	8.00	10.64	9.00	*	3.14	2.00	2.50
2531	1.41	2.40	2.25	9.28	6.50	8.00	9.90	9.50	9.00	9.64	7.00	8.00
2556	1.46	2.40	2.25	9.36	6.50	8.00	10.00	9.50	9.00	9.73	7.00	8.00
2532	1.92	2.05	2.25	8.49	6.50	9.00	11.00	10.00	10.00	4.21	4.00	4.00
2557	1.80	2.05	2.25	9.07	6.50	9.00	11.15	10.00	10.00	4.60	4.00	4.00
2533	1.02	.40	.82	5.20	5.50	*	5.86	7.00	6.00	4.90	1.50	*
2536	2.32	2.06	2.06	8.88	8.00	8.00	11.00	9.00	10.00	2.69	1.50	1.50
2537	1.23	1.03	1.03	8.41	8.00	8.00	10.69	9.00	10.00	2.33	2.00	2.00
2541	2.20	2.06	2.06	9.44	8.00	9.00	11.49	9.00	10.00	1.94	1.50	1.50
2543	1.10	1.00	1.00	9.42	8.00	7.00	11.26	9.00	8.00	2.63	2.00	2.00

* Not guaranteed.

DESCRIPTIVE LIST OF MANUFACTURERS' SAMPLES, 1900.*

Station number.	Manufacturer, place of business and brand.
	CLARK'S COVE FERTILIZER CO., BOSTON, MASS.
2390	Defiance Phosphate
	GREAT EASTERN FERTILIZER CO., RUTLAND, VT.
2395	Great Eastern High Grade Potato Manure
	PROVINCIAL CHEMICAL FERTILIZER CO., LIMITED, ST. JOHN, N. B.
2392	Provincial Chemical Fertilizer Co.'s Potato Phosphate
	THE QUINNIPIAC CO., BOSTON, MASS.
2393	Quinnipiac Climax Phosphate
	RUSSIAN CEMENT CO., GLOUCESTER, MASS.
2396	Essex Odorless Lawn Dressing
	STANDARD FERTILIZER CO., BOSTON, MASS.
2394	Standard Complete Manure

ANALYSES OF MANUFACTURERS' SAMPLES, 1900.*

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total. Found.	Total. Guaranteed.	Soluble.	Reverted.	Insoluble.	Available. Found.	Available. Guaranteed	Total. Found.	Total. Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
2390	.40	.68	1.08	.82	5.24	2.74	1.48	7.98	7.00	9.46	9.00	1.59	1.00
2395	2.38	1.00	3.38	3.29	4.87	3.25	1.86	8.12	6.00	9.98	....	10.64	10.00
2392	1.99	1.00	2.99	2.88	8.46	1.25	3.64	9.71	8.00	13.35	......	4.33	6.50
2393	.39	1.06	1.45	1.03	5.10	3.54	1.63	8.64	8.00	10.27	9.00	2.91	2.00
2396	3.92	.12	4.04	3.70	1.18	4.98	4.87	6.16	6.00	11.03	7.00	6.54	7.00
2394	2.40	.90	3.30	3.30	7.02	1.99	1.04	8.81	8.00	9.85	9.00	7.56	7.00

*These goods were received after the March Bulletin was issued.

DIGESTION EXPERIMENTS WITH SHEEP.

J. M. BARTLETT.

Several digestion experiments with sheep have been made since the last work of this nature was published in the Station Report for 1898*, and the results are presented in the following pages. The larger part of the work was done in 1899, but a few of the experiments were made in 1898 and the early part of 1900. The chief object of the experiments was to determine the nutritive value of the several fodders and feeds used in connection with feeding experiments and growing forage crops.

The method followed was practically the same as has been used heretofore at the Station, namely: Each experiment covered a period of twelve days, the first seven being devoted to preliminary feeding, and the last five to the experiment proper during which time the pouches were attached to the sheep and all the excrement collected, dried, weighed, and sampled for analysis. The rations were uniform and weighed throughout the twelve days. The coarse fodders were finely chopped, thoroughly mixed to make them uniform, and a small sample was taken out each time the sheep were fed to make a composite sample for analysis. In most of the experiments three or four sheep were employed, but in a few cases only two were used. Seven different sheep were used in all. The four used in 1899, not being very satisfactory, were replaced by other strong young wethers in January, 1900.

MATERIALS FED IN THE EXPERIMENTS.

Clover hay: Made largely of alsike clover cut early in July when nearly all the plants were in bloom.

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* Digestion experiments with sheep have been conducted at this station since 1885, and the results are given in the Reports for 1886, 1887, 1888, 1889, 1890, 1891, 1893, 1894, 1896, 1897 and 1898. The Report for 1891 contains a description of the digestion room, stalls, harness, etc., used in the experiments.

Clover hay: Made largely of alsike clover, from same field as the preceding lot, cut about ten days later when many of the plants were past bloom.

Clover silage: Made from the late cut clover described above. The material was well preserved in the silo and when fed was in good condition, well relished by the animals.

Corn meal: Made from ordinary western corn, rather coarsely ground.

Oats: Maine grown, medium quality, fed whole.

Hay: Largely timothy, fed with oats.

Oat and pea hay: Harvested when oats were in milk. The seeding was 1½ bushels oats and 1½ bushels Canada field peas to the acre.

Oat and pea silage: Same material as used for the hay, cut when the oats were in the milk and run through the ensilage cutter before putting in the silo.

Oat and vetch hay: Made from ordinary oats and sand vetch, *Vicia villosa,* cut when the oats were in milk. Seeding, one bushel oats and one bushel vetch to the acre.

Oat and vetch hay: Made from ordinary oats and spring vetch, *Vicia sativa.*

Oat and pea hay: Made from ordinary oats and Canada field peas, cut when the oats were in milk. Seeding, one bushel oats and two bushels peas to the acre.

Hay: Largely timothy.

Germ meal: A corn product resembling gluten feed.

Oats: Maine oats of first quality, very plump and heavy, fed whole.

Royal Oat Feed: An oat feed put out by the Akron Cereal Company.

Kentucky Mixed Feed: Wheat bran, adulterated.

THE COMPOSITION OF FEEDING STUFFS USED IN DIGESTION EXPERIMENTS IN 1899.

	Station number.	Water.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
ON FRESH BASIS.		%	%	%	%	%	%
Clover cut in early bloom	4152	19.21	7.80	12.60	23.36	35.24	1.79
Clover cut in late bloom	4156	17.73	6.92	11.99	24.25	36.71	2.40
Clover silage	4160	78.84	2.20	2.56	7.87	7.71	.82
Clover hay	4163	19.28	7.38	12.08	25.36	34.34	1.56
Hay, mostly timothy	4170	11.81	5.92	9.24	26.76	44.12	2.15
Oat and pea hay	4174	14.50	7.99	14.41	26.84	33.69	2.57
Oat and pea silage	4202	73.80	2.05	3.34	8.75	10.45	1.61
Oat and vetch hay	4212	21.08	5.49	7.71	26.12	37.20	2.30
Oat and vetch hay	4217	20.00	6.07	8.51	24.93	37.68	2.81
Oat and pea hay	4222	25.08	5.93	10.31	25.01	31.45	2.22
Hay, mostly timothy	4235	13.00	5.32	6.19	28.21	44.91	2.37
Oats	4145	11.15	2.92	12.56	11 28	57.70	4.39
Corn meal	4180	14.55	1.60	9.63	2.18	69.17	2.87
Oats	4234	13.16	3.15	11.38	10.31	57.06	4.94
Germ meal	4227	9.58	3.57	22.94	21.45	32.26	10.20
ON WATER-FREE BASIS.							
Clover hay (cut in early bloom)	4152	....	9.66	15.59	28.91	43.62	2.22
Clover hay (cut in late bloom)	4156	....	8.41	14.57	29.47	44.63	2.92
Clover silage	4160	....	10.39	12.10	37.18	36.45	3.88
Clover hay	4163	....	9.14	14.96	31.42	42.55	1.93
Hay, mostly timothy	4170	....	6.71	10.49	30.34	50.02	2.44
Oat and pea hay	4174	....	9.35	16.85	31.39	39.41	3.00
Oat and pea silage	4202	....	7.83	12.74	33.40	39.90	6.13
Oat and vetch hay	4212	....	6.95	9.77	33.10	47.26	2.92
Oat and vetch hay	4217	....	7.59	10.64	31.16	47.10	3.51
Oat and pea silage	4222	....	7.91	13.76	33 38	41.99	2.96
Hay, mostly timothy	4235	....	6.11	7.12	32.43	51.62	2.72
Oats	4145	....	3.28	14.09	12.70	64.99	4.94
Corn meal	4180	....	1.87	11.27	2 55	80.95	3.36
Oats	4234	....	3.63	13.10	11.87	65.71	5.69
Germ meal	4227	....	3.95	25.37	23.72	35.68	11.28

DIGESTION EXPERIMENT 70—CLOVER HAY CUT IN EARLY BLOOM.

RATIONS.

Fed Sheep I 600 grams per day.
Fed Sheep II 600 grams per day.
Fed Sheep III 600 grams per day.

COMPOSITION OF FODDER AND FECES.

	Station number.	Dry matter.	Water-Free.						
			Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.	Calories.
FODDER.		%	%	%	%	%	%	%	
Early cut clover.	4152	80.8	90.34	9.66	15.59	28.91	43.62	2.22	4367
FECES.									
Sheep I.	4153	....	86.27	13.73	12.94	32.94	36.69	3.70	4552
Sheep II..........	4154	....	88.91	11.09	12.80	32.05	40.10	3.96	4719
Sheep III.........	4155	....	86.80	13.20	11.91	33.56	37.67	3.66	4560

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Early cut clover	2424.0	2189.8	234.2	377.9	700.8	1057.3	53.8
Feces	943.6	814.0	129.6	122.1	310.8	346.2	34.9
Amount digested	1480.4	1375.8	104.6	255.8	390.0	711.1	18.9
Per cent digested	61.1	62.8	44.7	67.7	55.6	67.3	35.1
SHEEP II.							
Early cut clover	2424.0	2189.8	234.2	377.9	700.8	1057.3	53.8
Feces	1074.1	955.0	119.1	137.5	344.3	430.7	42.5
Amount digested	1349.9	1234.8	115.1	240.4	356.5	626.6	11.3
Per cent digested	55.7	56.4	49.1	63.6	50.9	59.3	21.0
SHEEP III.							
Early cut clover	2424.0	2189.8	234.2	377.9	700.8	1057.3	53.8
Feces	1064.3	923.8	140.5	126.8	357.2	400.9	38.9
Amount digested	1359.7	1266.0	93.7	251.1	343.6	656.4	14.9
Per cent digested	56.1	57.8	40.0	66.4	49.0	62.1	27.7
Average	57.6	59.0	44.6	65.9	51.8	62.9	27.9

FUEL VALUES FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
FODDER: EARLY CUT CLOVER.						
Sheep I	10586	4265	6321	223	6098	57.6
Sheep II	10586	5069	5517	209	5308	50.2
Sheep III	10586	4853	5733	218	5515	52.1

DIGESTION EXPERIMENT 71—CLOVER HAY CUT IN LATE BLOOM.

RATIONS.

Fed Sheep I 600 grams per day.

Fed Sheep II 600 grams per day.

Fed Sheep III 600 grams per day.

COMPOSITION OF FODDERS AND FECES.

	Station number.	Dry matter.	WATER-FREE. Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Late cut clover..	4156	82.3	91.59	8.41	14.57	29.47	44.63	2.92	4350
FECES.									
Sheep I	4157	....	87.78	12.22	11.07	37.52	35.27	3.92	4534
Sheep II	4158	....	87.74	12.26	9.30	38.92	34.78	4.76	4745
Sheep III	4159	....	89.55	10.45	11.82	35.96	37.73	4.04	4563

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Late cut clover	2469.0	2261.3	207.6	359.7	727.6	1101.9	72.1
Feces	1086.5	953.7	132.8	120.3	407.6	383.2	42.6
Amount digested	1382.5	1307.6	74.8	239.4	320.0	718.7	29.5
Per cent digested	56.0	57.8	36.0	66.5	44.0	65.2	40.9
SHEEP II.							
Late cut clover	2469.0	2211.3	207.6	359.7	727.6	1101.9	72.1
Feces	1118.1	981.0	137.1	104.0	435.2	388.6	53.2
Amount digested	1350.9	1280.3	70.5	255.7	292.4	713.3	18.9
Per cent digested	54.7	56.6	34.0	71.1	40.2	64.7	26.2
SHEEP III.							
Late cut clover	2469.0	2261.3	207.6	359.7	727.6	1101.9	72.1
Feces	1083.0	969.8	113.2	128.0	389.4	408.6	43.8
Amount digested	1386.0	1291.5	94.4	231.7	338.2	693.3	28.3
Per cent digested	56.1	57.1	45.4	64.4	46.5	62.9	39.2
Average	55.6	57.2	38.5	67.3	43.6	64.3	35.4

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
LATE CUT CLOVER.						
Sheep I	10740	4926	5814	198	5616	52.3
Sheep II	10740	5305	5435	223	5212	48.5
Sheep III	10740	4942	5798	202	5596	52.1

DIGESTION EXPERIMENT 72—CLOVER SILAGE MADE FROM CLOVER CUT IN LATE BLOOM.

RATIONS.

Fed Sheep I 3,000 grams per day.
Fed Sheep II 3,000 grams per day.
Fed Sheep III 3,000 grams per day.

COMPOSITION OF FODDER AND FECES.

	Laboratory number.	Dry matter.	WATER-FREE. Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%		
Clover silage.....	4160	21.2	89.61	10.39	12.10	37.18	36.45	3.88	4652
FECES.									
Sheep I.........	4161	....	89.36	10.64	15.21	34.63	35.28	4.24	4720
Sheep III........	4162	....	86.24	13.76	15.41	35.22	32.37	3.24	4506

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Clover silage	3180.0	2849.6	330.4	384.8	1182.3	1159.1	123.4
Feces.	1523.1	1361.0	162.1	231.7	527.4	537.3	64.6
Amount digested	1656.9	1488.6	168.3	153.1	654.9	621.8	58.8
Per cent digested............	52.1	52.2	50.9	39.8	55.4	53.7	47.7
SHEEP III.							
Clover silage	3180.0	2849.6	330.4	384.8	1182.3	1159.1	123.4
Feces.	1510.4	1302.6	207.8	232.8	532.0	488.9	48.9
Amount digested..............	1669.6	1547.0	122.6	152.0	650.3	670.2	74.5
Per cent digested............	52.5	54.3	37.1	39.5	55.0	57.9	60.4
Average.	52.3	53.3	44.0	39.7	55.2	55.8	54.1

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
CLOVER SILAGE.						
Sheep I	14793	7199	7594	133	7461	50.4
Sheep III	14793	6806	7987	132	7855	53.1

DIGESTION EXPERIMENT 73—CORN MEAL FED WITH CLOVER HAY.

RATIONS.

Fed Sheep I corn meal 300 grams, clover 400 grams per day.

Fed Sheep II corn meal 300 grams, clover 400 grams per day.

Fed Sheep III corn meal 300 grams, clover 400 grams per day.

COMPOSITION OF FODDER AND FECES.

	Station number.	Dry matter.	Water-free. Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Clover hay	4163	80.7	90.86	9.14	14.96	31.42	42.55	1.93	4370
Corn meal	4180	85.5	98.13	1.87	11.27	2.55	80.95	3.36	4352
FECES.									
Sheep I	4164	....	88.32	11.68	15.55	32.44	36.53	3.80	4727
Sheep II	4165	....	89.98	10.02	15.68	31.67	39.26	3.37	4649
Sheep III	4166	....	87.54	12.46	12.01	33.56	39.23	2.74	4631

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED FOR FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Fed in clover hay	1614.0	1466.5	147.5	241.5	507.1	686.8	31.1
Fed in corn meal	1282.5	1258.5	24.0	144.5	32.7	1038.2	43.1
Total fed	2896.5	2725.0	171.5	386.0	539.8	1725.0	74.2
Total feces	815.7	720.4	95.3	126.8	264.6	298.0	31.0
Total digested	2080.8	2004.6	76.2	259.2	275.2	1427.0	43.2
Digested from clover hay	903.8	847.6	53.1	160.6	223.1	447.8	12.7
Digested from corn meal	1177.0	1157.0	23.1	98.6	52.1	979.2	30.5
Per cent digested from corn meal	91.8	91.9	96.2	68.2	....	94.3	70.8
SHEEP II.							
Fed in clover hay	1614.0	1466.5	147.5	241.5	507.1	686.8	31.1
Fed in corn meal	1282.5	1258.5	24.0	144.5	32.7	1038.2	43.1
Total fed	2896.5	2725.0	171.5	386.0	539.8	1725.0	74.2
Total feces	907.8	816.8	91.0	142.3	287.5	356.4	30.6
Total digested	1988.7	1908.2	80.5	243.7	252.3	1368.6	43.6
Digested from clover hay	882.9	830.0	50.2	153.6	203.9	444.4	8.1
Digested from corn meal	1105.8	1078.2	30.3	90.1	48.4	924.2	35.5
Per cent digested from corn meal	86.2	85.7	....	62.4	....	89.0	82.3
SHEEP III.							
Fed in clover hay	1614.0	1466.5	147.5	241.5	507.1	686.8	31.1
Fed in corn meal	1282.5	1258.5	24.0	144.5	32.7	1038.2	43.1
Total fed	2896.5	2725.0	171.5	386.0	539.8	1725.0	74.2
Total feces	869.6	761.2	108.4	104.5	291.8	341.1	23.8
Total digested	2026.9	1963.8	63.1	281.5	248.0	1383.9	50.4
Digested from clover hay	905.5	837.4	67.0	155.5	235.8	432.0	12.2
Digested from corn meal	1121.4	1126.4	3.9	126.0	12.2	951.9	38.2
Per cent digested from corn meal	87.4	89.5	16.2	87.2	37.3	91.7	88.6
Average	88.5	89.0	68.7	72.9	....	91.7	80.6

FUEL VALUES FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
CORN MEAL.						
Sheep I	5581	572	5009	86	4923	88.2
Sheep II	5581	683	4898	78	4820	86.3
Sheep III	5581	732	4748	110	4638	83.1

DIGESTION EXPERIMENT 74—HAY, MOSTLY TIMOTHY.

RATIONS.

Fed Sheep II 600 grams hay per day.

Fed Sheep IV 500 grams hay per day.

COMPOSITION OF FODDER AND FECES.

	Station number.	Dry matter.	Water-free.						
			Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Hay	4170	88.2	93.29	6.71	10.49	30.34	50.02	2.44	4487
FECES.									
Sheep II	4168	... .	92.84	7.16	7.91	38.02	43.82	3.09	4741
Sheep IV	4169	....	92.42	7.58	9.36	36.32	43.45	3.29	4660

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED FOR THREE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
SHEEP II.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Hay	2646.0	2468.4	177.6	277.5	802.8	1323.5	64.6
Feces	1154.2	1071.6	82.6	91.3	438.8	505.8	35.7
Amount digested	1491.8	1396.8	95.0	186.2	364.0	817.7	28.9
Per cent digested	56.4	56.6	53.5	67 1	45.3	61.8	44.7
SHEEP IV.							
Hay	2205.0	2057.0	148.0	231.3	669.0	1102.9	53.8
Feces	908.9	840.0	68.9	85.1	330.1	394.9	29.9
Amount digested	1296.1	1217.0	79.1	146.2	338.9	708.0	23.9
Per cent digested	58.8	59.2	53.4	63.2	50.7	64.2	44.4
Average	57.6	57.9	53.5	65.2	48.0	63.0	44.6

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
HAY.						
Sheep II	11872	5472	6400	162	6238	52.6
Sheep IV	9894	4236	5658	126	5532	55.9

DIGESTION EXPERIMENT 75—OATS FED WITH HAY.

RATIONS.

Fed Sheep I oats, 400 grams; hay, 200 grams per day.

Fed Sheep II oats, 400 grams; hay, 200 grams per day.

Fed Sheep III oats, 400 grams; hay, 200 grams per day.

COMPOSITION OF FODDERS AND FECES.

	Station number.	Total dry matter.	Water-free.						
			Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Ether extract.	Calories per gram.
FODDERS.		%	%	%	%	%	%	%	
Hay	4170	88.2	93.29	6.71	10.49	30.34	50.02	2.44	4487
Oats	4145	88.9	96.72	3.28	14.09	12.70	64.99	4.94	4683
FECES.									
Sheep I........	4171	....	91.01	8.99	11.21	31.04	45.90	2.86	4668
Sheep II........	4172	....	91.68	8.32	8.16	34.10	47.13	2.29	4542
Sheep III........	4173	....	90.69	9.31	11.24	30.84	45.77	2.84	4728

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED FOR FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Fed in hay	882.0	822.8	59.2	92.5	267.6	441.2	21.5
Fed in oats	1778.0	1719.7	58.3	250.5	225.8	1155.5	87.9
Total fed	2660.0	2542.5	117.5	343.0	493.4	1596.7	109.4
Total feces	884.5	805.0	79.5	99.2	274.5	406.0	25.3
Total digested	1775.5	1737.5	38.0	243.8	218.9	1190.7	84.1
Digested from hay	508.0	476.4	31.7	60.3	128.4	278.0	95.9
Digested from oats	1267.5	1261.1	6.3	183.5	90.5	912.7	....
Per cent digested from oats	71.3	73.3	10.8	73.2	40.1	78.9	....
SHEEP II.							
Fed in hay	882.0	822.8	59.2	92.5	267.6	441.2	21.5
Fed in oats	1778.0	1719.7	58.3	250.5	225.8	1155.5	87.9
Total fed	2660.0	2542.5	117.5	343.0	493.4	1596.7	109.4
Total feces	972.7	891.8	80.9	79.4	331.7	458.4	22.3
Total digested	1687.3	1650.7	36.6	263.6	161.7	1138.3	87.1
Digested from hay	508.0	476.4	31.7	60.3	128.4	278.0	95.9
Digested from oats	1179.3	1174.3	4.9	203.3	33.3	860.3	....
Per cent digested from oats	66.3	68.3	8.4	81.1	14.7	74.5	....
SHEEP III.							
Fed in hay	882.0	822.8	59.2	92.5	267.6	441.2	21.5
Fed in oats	1778.0	1719.7	58.3	250.5	225.8	1155.5	87.9
Total fed	2660.0	2542.5	117.5	343.0	493.4	1596.7	109.4
Total feces	908.6	824.0	84.6	102.1	280.2	415.9	25.8
Total digested	1751.4	1718.5	32.9	240.9	213.2	1180.8	83.6
Digested from hay	508.0	476.4	31.7	60.3	128.4	278.0	95.9
Digested from oats	1243.4	1242.1	1.2	180.6	84.8	902.8	....
Per cent digested from oats	69.9	72.2	2.1	72.1	37.6	78.1	....
Average (%)	69.2	71.3	5.7	75.5	30.8	77.2	....

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea, etc.	Total available fuel value.	Per cent available fuel value.
Sheep I	8326	2364	5962	160	5802	69.7
Sheep II	8326	2653	5673	177	5496	60.1
Sheep III	8326	2531	5795	157	5638	61.7

DIGESTION EXPERIMENT 76—OAT AND PEA HAY.

RATIONS.

Fed Sheep I 600 grams per day.
Fed Sheep II 600 grams per day.
Fed Sheep III 400 grams per day.
Fed Sheep IV 400 grams per day.

WASTE LEFT BY EACH SHEEP FOR FIVE DAYS.

Sheep I.	Sheep II.	Sheep III.	Sheep IV.
251 grams.	291 grams.	257 grams.	167 grams.

COMPOSITION OF WASTE.

Water.	Ash.	Protein.	Nitrogen-free extract.	Fiber.	Fat.
24.54	6.99	4.58	29.99	32.85	1.05

COMPOSITION OF FODDER AND FECES.

	Station number.	Dry matter.	Water-free.						
			Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Oat and pea hay.	4174	85.50	90.65	9.35	16.85	31.39	39.41	3.00	4490
FECES.									
Sheep I	4176	....	89.54	10.46	12.16	32.51	40.77	4.10	4690
Sheep II	4177	....	89.62	10.38	13.13	32.67	39.74	4.08	4702
Sheep III	4178	......	88.45	11.55	15.13	29.23	40.00	4.09	4635
Sheep IV	4179	....	88.81	11.19	15.08	30.65	39.31	3.77	4402

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Oat and pea hay	2380.0	2157.3	222.7	421.0	724.7	937.3	74.3
Feces	890.1	797.0	93.1	108.2	289.4	362.9	36.5
Amount digested	1489.9	1360.3	129.6	312.8	435.3	574.4	37.8
Per cent digested	62.6	63.1	58.2	74.3	60.1	61.3	50.9
SHEEP II.							
Oat and pea hay	2341.6	2122.5	219.1	418.6	708.0	922.1	73.8
Feces	777.0	696.3	80.7	102.0	253.8	308.8	31.7
Amount digested	1564.6	1426.2	138.4	316.6	454.2	613.3	42.1
Per cent digested	66.8	67.2	63.1	75.6	64.1	66.5	57.0
SHEEP III.							
Oat and pea hay	1516.0	1374.2	141.9	276.4	452.3	596.9	48.6
Feces	562.1	497.2	64.9	85.1	164.3	224.8	23.0
Amount digested	953.9	877.0	77.0	191.3	288.0	372.1	25.6
Per cent digested	62.9	64.0	54.4	69.2	63.7	62.3	52.7
SHEEP IV.							
Oat and pea hay	1584.0	1135.8	148.2	280.6	481.9	623.7	49.6
Feces	566.9	503.5	63.4	85.5	173.8	222.8	21.4
Amount digested	1017.1	632.3	84.8	195.1	308.1	400.9	28.2
Per cent digested	64.2	55.7	57.2	69.5	63.9	64.3	56.8
Average	64.2	62.5	58.2	72.2	63.0	63.7	54.4

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Full value of urea.	Total fuel value.	Per cent fuel value.
PEAS AND OATS.						
Sheep I.	10685	4175	6510	272	6238	58.3
Sheep II	10513	3653	6860	275	6585	62.6
Sheep III	6806	2252	4554	166	4388	64.5
Sheep IV.	7112	2217	4895	170	4725	67.5

DIGESTION EXPERIMENT 77—OAT AND PEA SILAGE.

RATIONS.

Fed Sheep I 2,000 grams per day.
Fed Sheep II 2,000 grams per day.

WASTE LEFT BY EACH SHEEP FOR FIVE DAYS.

Sheep I.	Sheep II.
1060 grams.	286 grams.

COMPOSITION OF WASTE.

Water.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
75.08	1.92	3.20	9.34	9.03	1.43

COMPOSITION OF FODDER AND FECES.

	Station number.	Dry matter.	WATER-FREE.						
			Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Ether extract.	Calories.
FODDER.		%	%	%	%	%	%	%	
Oat & pea silage.	4202	26.2	92.17	7.83	12.74	33.40	39.90	6.13	4209
FECES.									
Sheep I	4204	....	88.1	11 90	10.24	35.46	38.54	3.86	4588
Sheep II	4205	....	90.15	9.85	8.61	38.04	40.19	3.31	4588

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Oat and pea silage	2358.0	2173.5	184.5	300.6	787.5	904.5	144.9
Feces	751.1	661.7	89.3	77.0	276.3	289.5	29.0
Digested	1606.9	1511.8	95.2	223.6	511.2	651.0	115.9
Per cent digested	68.1	69.6	51.6	74.4	64.9	69.9	73.1
SHEEP II.							
Oat and pea silage	2620.0	2415.0	205.0	334.0	875.0	1045.0	161.0
Feces	976.7	880.5	96.2	84.1	371.5	370.3	37.1
Digested	1643.3	1534.5	108.8	249.9	503.5	674.7	123.9
Per cent digested	62.8	63.5	53.1	74.8	57.6	64.1	76.9
Average per cent	65.5	66.6	52.4	74.6	61.3	67.0	75.0

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
FODDER: OAT AND PEA SILAGE.						
Sheep I	9926	3446	6480	195	6285	50.3
Sheep II	11027	4481	6546	217	6329	57.4

DIGESTION EXPERIMENT 78—OAT AND VETCH HAY.

RATIONS.

Fed Sheep I 500 grams per day.
Fed Sheep II 500 grams per day.
Fed Sheep III 500 grams per day.

WASTE LEFT BY EACH SHEEP FOR FIVE DAYS.

Sheep I.	Sheep II.	Sheep III.
90 grams.	56 grams.	108 grams.

COMPOSITION OF WASTE.

Water.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
29.8	6.54	4.02	23.0	35.66	.98

COMPOSITION OF FODDERS AND FECES.

	Station number.	Dry matter.	Water-free. Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.	Calories.
FODDER.		%	%	%	%	%	%	%	
Oat and vetch hay	4212	78.92	93.05	6.95	9.77	33.10	47.26	2.92	4410
FECES.									
Sheep I	4213	....	91.64	8.36	7.98	38.53	42.96	2.17	4742
Sheep II	4214	....	91.17	8.83	7.41	37.23	43.77	2.76	4486

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Oat and vetch hay	1909.1	1778.0	131.1	189.1	632.2	900.0	56.7
Feces	851.4	780.2	71.1	67.9	328.0	365.8	18.5
Amount digested	1057.7	997.8	59.9	121.2	304.2	534.2	38.2
Per cent digested	55.4	56.1	45.7	64.1	48.1	59.4	67.4
SHEEP II.							
Oat and vetch hay	1933.5	1800.1	133.4	190.5	640.2	912.3	57.1
Feces	863.9	787.6	76.3	64.0	321.6	378.1	23.9
Amount digested	1069.6	1012.5	57.1	126.5	318.6	534.2	33.2
Per cent digested	55.3	56.2	42.8	66.4	49.8	58.5	58.1
Average	55.4	56.2	44.3	65.3	49.0	59.0	62.8

FUEL VALUES FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
FODDER: OAT AND VETCH HAY.						
Sheep I	8419	4031	4388	106	4282	50.9
Sheep II	8527	3872	4655	110	4545	53.3

DIGESTION EXPERIMENT 79—OAT AND VETCH HAY.

RATIONS.

Fed Sheep I 500 grams per day.

Fed Sheep II 500 grams per day.

Fed Sheep III 500 grams per day.

COMPOSITION OF FODDERS AND FECES.

	Station number.	Dry matter.	WATER-FREE. Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.	Calories.
FODDER.		%	%	%	%	%	%	%	
Oat and vetch hay	4217	80.00	92.41	7.59	10.64	31.16	47.10	3.51	4342
FECES.									
Sheep I.........	4218	....	92.96	7.04	8.13	37.97	44.46	2.40	4611
Sheep II.	4219	....	92.00	8.00	7.92	39.39	42.44	2.25	4651
Sheep III.........	4220	....	92.09	7.91	8.50	35.99	45.32	2.28	4570

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Oat and vetch hay	1967.6	1818.0	149.6	210.5	610.2	927.6	69.7
Feces	851.7	791.7	60.0	69.2	323.4	378.7	20.4
Amount digested	1115.9	1026.3	89.6	141.3	286.8	548.9	49.3
Per cent digested	56.7	56.5	59.9	67.1	47.0	59.1	70.7
SHEEP II.							
Oat and vetch hay	1981.5	1830.9	150.6	211.5	615.8	933.7	69.9
Feces	784.5	721.7	62.8	62.1	309.0	332.9	17.7
Amount digested	1197.0	1109.2	87.8	149.4	306.8	600.8	52.2
Per cent digested	60.4	60.6	58.3	70.6	49.8	64.4	74.7
SHEEP III.							
Oat and vetch hay	2000.0	1848.2	151.8	212.8	623.2	942.0	70.2
Feces	734.7	676.6	58.1	62.4	264.4	333.0	16.8
Amount digested	1265.3	1171.6	93.7	150.4	358.8	609.0	53.4
Per cent digested	63.3	63.4	62.4	70.7	57.6	64.6	76.1
Average	60.1	60.2	60.2	69.5	51.5	62.7	73.8

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
FODDER: OAT AND VETCH HAY.						
Sheep I	8543	3927	4616	123	4493	52.6
Sheep II	8604	3649	4955	130	4825	56.1
Sheep III	8684	3358	5326	131	5195	59.8

DIGESTION EXPERIMENT 80—OAT AND PEA HAY.

RATIONS.

Fed Sheep I 500 grams per day.

Fed Sheep II 500 grams per day.

Fed Sheep III 500 grams per day.

WASTE LEFT BY EACH SHEEP FOR FIVE DAYS.

Sheep I.	Sheep II.	Sheep III.
26 grams.	50 grams.	75 grams.

COMPOSITION OF WASTE.

Water.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
41.46	4.39	5.50	22.77	24.63	1.25

COMPOSITION OF FODDERS AND FECES.

	Laboratory number.	Dry matter.	WATER-FREE.						
			Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Oat and pea hay.	4222	74.93	92.09	7.91	13.76	33.38	41.99	2.96	4445
FECES.									
Sheep I........	4223	38.22	91.89	8.11	7.28	39.61	42.70	2.30	4575
Sheep II........	4224	35.79	92.10	7.90	9.31	36.09	43.88	2.82	4592
Sheep III.........	4226	41.89	92.64	7.36	8.74	39.18	42.30	2.42	4650

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Oat and pea hay	1856.4	1709.5	146.9	256.2	618.7	779.5	55.0
Feces	785.8	722.1	63.7	57.2	311.3	335.5	18.1
Amount digested	1070.6	987.4	83.2	199.0	307.4	444.0	36.9
Per cent digested	57.6	57.8	56.6	77.7	49.7	57.0	67.1
SHEEP II.							
Oat and pea hay	1843.3	1697.3	145.9	255.0	613.6	774.0	54.8
Feces	812.0	747.9	64.1	75.6	293.1	356.4	22.9
Amount digested	1031.3	949.4	81.8	179.4	320.5	417.6	31.9
Per cent digested	55.9	55.9	56.1	70.3	52.2	54.	58.2
SHEEP III.							
Oat and pea hay	1826.4	1681.7	144.7	253.4	607.0	766.9	54.4
Feces	694.1	643.0	51.1	60.7	271.9	293.6	16.8
Amount digested	1132.3	1038.7	93.6	192.7	325.1	473.3	37.6
Per cent digested	62.0	61.8	64.7	76.0	53.6	61.7	69.1
Average	58.5	58.5	59.1	74.7	51.8	57.6	64.8

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
FODDER: OAT AND PEA HAY.						
Sheep I.	8252	3595	4657	173	4484	54.3
Sheep II	8194	3729	4465	156	4309	52.6
Sheep III.	8118	3228	4890	168	4722	58.2

DIGESTION EXPERIMENT 81—HAY, MOSTLY TIMOTHY.

RATIONS.

Fed Sheep I 800 grams hay per day.
Fed Sheep II 800 grams hay per day.
Fed Sheep III 800 grams hay per day.

COMPOSITION OF FODDERS AND FECES.

	Laboratory number.	Dry matter.	Water-free.						
			Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Hay	4240	87.00	93.89	6.11	7.12	32.43	51.62	2.72	4599
FECES.									
Sheep I	4241	....	89.39	10.61	7.93	30.86	47.99	2.61	4530
Sheep II	4242	....	91.00	9.00	6.65	32.68	49.19	2.48	4578
Sheep III	4243	....	91.05	8.95	7.04	33.31	48.09	2.61	4603

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Hay	3480.0	3267.4	212.6	247.8	1128.6	1796.4	94.6
Feces	1501.1	1341.8	159.3	119.0	463.2	720.4	39.2
Amount digested	1978.9	1925.6	53.3	128.8	665.4	1076.0	55.4
Per cent digested	56.8	58.9	25.1	52.0	59.0	59.9	58.6
SHEEP II.							
Hay	3480.0	3267.4	212.6	247.8	1128.6	1796.4	94.6
Feces	1723.6	1568.5	155.1	114.6	563.3	847.8	42.8
Amount digested	1756.4	1698.9	57.5	133.2	565.3	948.6	51.8
Per cent digested	50.5	52.0	27.0	53.7	50.1	52.8	54.8
SHEEP III.							
Hay	3480.0	3267.4	212.6	247.8	1128.6	1796.4	94.6
Feces	1634.3	1488.0	146.3	115.1	544.4	785.9	42.6
Amount digested	1845.7	1779.4	66.3	132.7	584.2	1010.5	52.0
Per cent digested	53.0	54.5	31.2	53.5	51.8	56.3	55.0
Average	53.4	55.1	27.8	53.1	53.6	56.3	56.1

FUEL VALUES FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
FODDER: HAY.						
Sheep I	15973	6800	9173	112	9061	56.7
Sheep II	15973	7889	8084	116	7968	49.9
Sheep III	15973	7523	8450	115	8335	52.2

DIGESTION EXPERIMENT 82—OATS FED WITH HAY.

RATIONS.

Fed Sheep I 400 grams oats and 400 grams hay per day.
Fed Sheep II 400 grams oats and 400 grams hay per day.
Fed Sheep III 400 grams oats and 400 grams hay per day.

Sheep I left 177 grams waste for the five days.

COMPOSITION OF FODDERS AND FECES.

	Station number.	Dry matter.	Water-free. Organic matter.	Ash.	Protein.	Crude Fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Hay	4235	87.00	93.89	6.11	7.12	32.43	51.62	2.72	4599
Oats	4234	86.84	96.93	3.63	13.10	11.87	65.71	5.69	4685
FECES.									
Sheep I	4236	....	91.89	8.11	8.26	30.83	50.24	2.56	4681
Sheep II	4237	....	92.07	7.93	7.91	31.85	50.07	2.24	4651
Sheep III	4238	....	90.41	9.59	8.44	30.18	49.34	2.45	4588

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PER CENT DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Fed in hay	1582.3	1484.0	98.3	117.7	515.5	806.1	44.7
Fed in oats	1736.8	1673.8	63.0	227.5	206.2	1141.3	98.8
Total fed	3319.1	3157.8	161.3	345.2	721.7	1947.4	143.5
Total feces	1213.0	1114.6	98.4	100.2	374.0	609.4	31.0
Total digested	2106.1	2043.2	62.9	245.0	347.7	1338.0	112.5
Digested from hay	898.8	874.1	24.7	61.2	304.1	482.8	26.2
Digested from oats	1207.3	1169.1	38.2	183.8	43.6	855.2	86.3
Per cent digested from oats	69.5	69.8	60.6	80.8	21.1	74.9	87.3
SHEEP II.							
Fed in hay	1740.0	1633.7	106.3	123.9	564.3	898.2	47.3
Fed in oats	1736.8	1673.8	63.0	227.5	206.2	1141.3	98.8
Total fed	3476.8	3307.5	169.3	351.4	770.5	2039.5	146.1
Total feces	1319.1	1214.5	104.6	104.3	420.1	660.5	29.6
Total digested	2157.7	2093.0	64.7	247.1	350.4	1379.0	116.5
Digested from hay	878.2	849.4	28.8	66.6	282.6	474.3	25.9
Digested from oats	1279.5	1243.6	35.9	180.5	67.8	904.7	90.6
Per cent digested from oats	73.6	74.3	57.0	79.3	32.9	79.3	91.7
SHEEP III.							
Fed in hay	1740.0	1633.7	106.3	123.9	564.3	898.2	47.3
Fed in oats	1736.8	1673.8	63.0	227.5	206.2	1141.3	98.8
Total fed	3476.8	3307.5	169.3	351.4	770.5	2039.5	146.1
Total feces	1314.8	1188.7	126.1	111.0	396.8	648.7	32.2
Total digested	2162.0	2118.8	43.2	240.4	373.7	1390.8	113.9
Digested from hay	922.9	889.7	33.2	66.4	292.1	505.2	26.0
Digested from oats	1239.1	1229.1	10.0	174.0	81.6	885.6	87.9
Per cent digested from oats	71.3	73.4	15.9	76.5	39.5	77.6	89.0
Average	71.5	72.5	44.5	78.9	31.2	77.3	89.3

FUEL VALUES FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
FODDER: OATS.						
Sheep I	8137	3179	4957	160	4797	60.0
Sheep II	8137	2190	5947	157	5790	71.2
Sheep III	8137	2270	4867	152	5715	70.2

DIGESTION EXPERIMENT 83—ROYAL OAT FEED.

RATIONS.

Fed Sheep I 400 grams Royal Oat Feed and 400 grams hay.
Fed Sheep II 400 grams Royal Oat Feed and 400 grams hay.
Fed Sheep III 400 grams Royal Oat Feed and 400 grams hay.

Left by Sheep I, 118 grams hay for five days.

COMPOSITION OF FODDERS AND FECES.

	Station number.	Dry matter.	Water-free.						
			Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Hay	4244	87.00	93.89	6.11	7.12	32.43	51.62	2.72	4599
Royal Oat Feed	4245	89.63	93.61	6.39	7.46	24.98	57.73	3.44	4430
FECES.									
Sheep I	4246	....	91.68	8.32	5.45	32.42	52.26	1.55	4478
Sheep II	4247	....	90.87	9.13	6.09	30.84	52.20	1.74	4472
Sheep III	4248	....	91.58	8.42	5.58	31.91	52.59	1.50	4480

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Fed in hay	1740	1633.7	106.3	123.9	564.3	898.2	47.3
Fed in "Royal Oat Feed"	1792.6	1678.1	114.5	133.7	447.8	1034.8	61.7
Total fed	3532.6	3311.8	220.8	257.6	1012.1	1933.0	109.0
Total feces	1789.1	1640.2	148.9	97.5	580.0	935.0	27.7
Total digested	1743.5	1671.6	71.9	160.1	432.1	998.0	81.3
Digested from hay	989.5	962.8	26.6	64.4	332.7	538.0	27.7
Digested from "Royal Oat Feed"	754.0	708.8	45.3	95.7	99.4	460.0	53.6
Per cent digested from "Royal Oat Feed"	42.1	42.2	39.6	71.6	20.0	48.9	86.8
SHEEP II.							
Fed in hay	1630.2	1529.8	100.4	118.0	528.0	838.0	45.8
Fed in "Royal Oat Feed"	1792.6	1678.1	114.5	133.7	447.8	1034 8	61.7
Total fed	3422.8	3207.9	214.9	251.7	975.8	1872.8	107.5
Total feces	1676.3	1523.3	153.0	102.1	517.0	875.0	29.2
Total digested	1746.5	1684.6	61.9	149.6	458.8	997.8	78.3
Digested from hay	822.7	795.5	27.1	63.4	264.5	442.5	25.1
Digested from "Royal Oat Feed"	923.8	889.1	34.8	86.2	194.3	555.3	53.2
Per cent digested from "Royal Oat Feed"	51.3	53.0	32.9	64.5	43.4	53.7	86.2
SHEEP III.							
Fed in hay	1696.3	1592.4	103.9	121.6	549.9	874.2	46.7
Fed in "Royal Oat Feed"	1792.6	1678.1	114.5	133.7	447.8	1034.8	61.7
Total fed	3488.9	3270.5	218.4	255.3	997.7	1909.0	108.4
Total feces	1710.8	1566.7	144.1	95.5	545.9	899.7	25.7
Total digested	1778.1	1703.8	74.3	159.8	451.6	1009.3	82.7
Digested from hay	906.8	877.5	28.9	64.6	294.7	492.2	26.2
Digested from "Royal Oat Feed"	871.3	826.3	45.4	95.2	156.9	517.1	56.5
Per cent digested from "Royal Oat Feed"	48.6	49.2	39.7	71.2	35.9	50.0	91.6
Average	47.3	48.1	37.4	69.1	33.1	50.9	88.2

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
ROYAL OAT FEED.						
Sheep I	7941	4612	3329	83	3246	40.9
Sheep II	7941	3651	4290	75	4215	53.1
Sheep III	7941	3902	4039	83	3956	49.8

DIGESTION EXPERIMENT 84—MIXED FEED.

RATIONS.

Fed Sheep I 400 grams mixed feed and 400 grams hay.
Fed Sheep II 400 grams mixed feed and 400 grams hay.
Fed Sheep III 400 grams mixed feed and 400 grams hay.

COMPOSITION OF FODDERS AND FECES.

	Station number.	Dry matter.	Water-free.						
			Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Hay	4251	87.00	93.89	6.11	7.12	32.43	51.62	2.72	4599
Mixed feed	4250	87.64	94.27	5.73	12.98	14.56	62.11	4.62	4513
FECES.									
Sheep I	4252	....	90.07	9.93	9.80	30.16	48.28	1.83	4459
Sheep II	4253	....	90.12	9.88	9.71	30.28	48.27	1.86	4429
Sheep III	4254	....	89.97	10.03	9.93	28.73	49.02	2.29	4449

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Fed in hay	1740	1633.7	106.3	123.9	564.3	898.2	47.3
Fed in mixed feed	1752.8	1652.4	100.4	227.5	255.2	1088.7	81.0
Total fed	3492.8	3286.1	206.7	351.4	819.5	1986.9	128.3
Total feces	1468.2	1322.4	145.8	143.9	442.6	708.9	26.9
Total digested	2024.6	1964.7	60.9	207.5	376.9	1278.0	101.4
Digested from hay	989.5	962.8	26.6	64.4	332.7	538.0	27.7
Digested from mixed feed	1035.1	1001.9	34.3	143.1	44.2	740.0	73.7
Per cent digested from mixed feed	59.1	60.6	34.2	62.9	17.3	68.0	91.0
SHEEP II.							
Fed in hay	1740	1633.7	106.3	123.9	564.3	898.2	47.3
Fed in mixed feed	1752.8	1652.4	100.4	227.5	255.2	1088.7	81.0
Total fed	3492.8	3286.1	206.7	351.4	819.5	1986.9	128.3
Total feces	1468.9	1323.8	145.1	142.6	444.8	709.1	27.3
Total amount digested	2023.9	1962.3	61.6	208.8	374.7	1277.8	101.0
Digested from hay	878.2	849.4	28.8	66.6	282.6	474.3	25.9
Digested from mixed feed	1145.7	1112.9	32.8	142.2	92.1	803.5	75.1
Per cent digested from mixed feed	65.4	67.4	32.7	62.5	36.1	73.8	92.7
SHEEP III.							
Fed in hay	1740	1633.7	106.3	123.9	564.3	898.2	47.3
Fed in mixed feed	1752.8	1652.4	100.4	227.5	255.2	1088.7	81.0
Total fed	3492.8	3286.1	206.7	351.4	819.5	1986.9	128.3
Total feces	1476.0	1330.2	145.8	143.3	446.9	712.5	27.5
Total digested	2016.8	1955.9	60.9	208.1	372.6	1274.4	100.8
Digested from hay	922.9	889.7	33.2	66.4	292.1	505.2	26.0
Digested from mixed feed	1093.9	1066.2	27.7	141.7	80.5	769.2	74.8
Per cent digested from mixed feed	62.4	64.5	27.6	62.3	31.5	70.7	92.4
Average	62.3	64.2	31.5	62.6	28.3	70.8	92.0

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
MIXED FEED.						
Sheep I	7909	2497	5412	125	5287	66.8
Sheep II	7909	1918	5991	124	5867	74.2
Sheep III	7909	2165	5753	123	5640	71.3

DIGESTION EXPERIMENT 85—CORN GERM.

RATIONS.

Fed Sheep I 300 grams corn germ, 400 grams hay per day.
Fed Sheep II 300 grams corn germ, 400 grams hay per day.
Fed Sheep III 300 grams corn germ, 400 grams hay per day.

COMPOSITION OF FODDERS AND FECES.

	Station number.	Dry matter.	WATER-FREE.						
			Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Calories per gram.
FODDER.		%	%	%	%	%	%	%	
Hay	4235	87.00	93.89	6.11	7.12	32.43	51.62	2.72	4599
Corn Germ	4227	90.42	96.05	3.95	25.37	23.72	35.68	11.28	5110
FECES.									
Sheep I	4255	....	90.06	9.94	12.57	30.70	44.59	2.20	4527
Sheep II	4256	....	91.05	8.95	12.66	30.34	45.64	2.41	4603
Sheep III	4257	....	89.65	10.31	14.53	29.30	43.55	2.31	4520

TOTAL NUTRIENTS IN FOOD EATEN AND FECES EXCRETED IN FIVE DAYS AND PERCENTAGES DIGESTED.

	Dry matter.	Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
SHEEP I.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Fed in hay	1740.0	1633.7	106.3	123.9	564.3	898.2	47.3
Fed in corn germ	1456.3	1398.8	57.5	369.2	345.4	519.7	164.4
Total fed	3196.3	3032.5	163.8	493.1	909.7	1417.9	211.7
Total feces	1135.2	1022.3	113.0	142.7	348.4	506.1	25.0
Total digested	2061.1	2010.2	50.8	350.4	561.3	911.8	186.7
Digested from hay	989.5	962.8	26.6	64.4	332.7	538.0	27.7
Digested from corn germ	1071.6	1047.4	24.2	286.0	228.6	373.8	159.0
Per cent digested from corn germ	73.6	74.9	42.1	77.5	66.2	71.9	96.7
SHEEP II.							
Fed in hay	1740.0	1633.7	106.3	123.9	564.3	898.2	47.3
Fed in corn germ	1456.3	1398.8	57.5	369.2	345.4	519.7	164.4
Total fed	3196.3	3032.5	163.8	493.1	909.7	1417.9	211.7
Total feces	1151.5	1048.4	103.1	145.8	349.4	525.6	27.8
Total digested	2044.8	1984.1	63.7	347.3	560.3	892.3	183.9
Digested from hay	989.5	962.8	26.6	64.4	332.7	538.0	27.7
Digested from corn germ	1055.3	1021.3	37.1	282.9	227.6	354.3	156.2
Per cent digested from corn germ	72.5	73.0	64.5	76.6	65.9	68.2	95.0
SHEEP III.							
Fed in hay	1740.0	1633.7	106.3	123.9	564.3	898.2	47.3
Fed in corn germ	1456.3	1398.8	57.5	369.2	345.4	519.7	164.4
Total fed	3196.3	3032.5	163.8	493.1	909.7	1417.9	211.7
Total feces	1116.2	1001.1	115.1	162.2	327.1	486.1	25.7
Total digested	2080.1	2031.4	48.7	330.9	582.6	931.8	186.0
Digested from hay	989.5	962.8	26.6	64.4	332.7	538.0	27.7
Digested from corn germ	1090.6	1068.6	22.1	266.5	249.9	393.8	158.3
Per cent digested from corn germ	74.9	76.4	38.4	72.2	72.4	75.8	96.4
Average	73.7	74.8	48.3	75.4	68.2	71.9	96.0

FUEL VALUE FOR FIVE DAYS.

	Fuel value of food.	Fuel value of feces.	Fuel value of food digested.	Fuel value of urea.	Total available fuel value.	Per cent available fuel value.
FODDER: CORN GERM.						
Sheep I	7442	1739	5703	249	5454	73.3
Sheep II	7442	1356	6086	246	5840	78.5
Sheep III	7442	1282	6159	232	5927	79.6

SUMMARY OF DIGESTION COEFFICIENTS OBTAINED IN THE EXPERIMENTS HERE REPORTED.

	Number of experiment.	Dry matter.	Organic matter.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.
	%	%	%	%	%	%	%	%
Clover hay, cut in early bloom	70	57.6	59.0	44.6	65.9	51.8	62.9	27.9
Clover hay, cut in late bloom......	71	55.6	57.2	38.5	67.3	43.6	64.3	35.4
Clover silage made from clover cut in late bloom	72	52.3	53.3	44.0	39.7	55.2	55.8	54.1
Corn meal............	73	88.5	89.0	68 7	72.9	....	91.7	80.6
Hay, mostly timothy	74	57.6	57.9	53.5	65.2	48.0	63.0	44.6
Oats	75	69.2	71.3	.....	75.5	30.8	77.2	.....
Pea and oat hay......................	76	64.2	62.5	58.2	72.2	63.0	63.7	54.4
Oat and pea silage	77	65.5	66.6	52.4	74.6	61.3	67.0	75.0
Oat and vetch hay	78	55.4	56.2	44.3	65.3	49.0	59.0	62.8
Oat and vetch hay	79	60.1	60.2	60.2	69.5	51.5	62.7	73.8
Oat and pea hay	80	58.5	58.5	59.1	74.7	51.8	57.6	64.8
Hay, mostly timothy	81	53.4	55.1	27.8	53.1	53.6	56.3	56.1
Oats	82	71.5	72.5	44.5	78.9	31.2	77.3	89.3
Royal oat feed........................	83	47.3	48.1	37.4	69.1	33.1	50.9	88.2
Mixed feed	84	62.3	64.2	31.5	62.6	28.3	70.8	92.0
Corn germ	85	73.7	74.8	48.3	75.4	68.2	71.9	96.0

A COMPARISON OF DETERMINED AND CALCULATED HEATS OF COMBUSTION.

L. H. MERRILL.

It has been frequently observed in this laboratory and elsewhere that the heats of combustion of vegetable foods as determined are higher than the results obtained by calculation when the usual factors are employed. This fact is illustrated by the wheat products in the following table in which it will be seen that the differences range from .026 to .430 calories, or from nearly one to ten percent of the determined value. The wheat products were chosen because they contain nutrients of precisely the same character and origin, but in varying proportions. The milling products are placed in the table below the wheats from which they were derived. The caluculated results are obtained by the use of Rubner's factors, viz.: for 1 gram protein, 5.5 calories; for fat, 9.3 calories; for carbohydrates, 4.1 calories.

HEATS OF COMBUSTION OF WHEATS AND THEIR MILLING PRODUCTS DETERMINED COMPARED WITH THE CALCULATED VALUES.

Laboratory number.	Material.	Heats of Cumbustion.			Crude fiber.
		Determined.	Calculated.	Difference.	
		Calories	Calories.	Calories.	%
6301	Wheat	3.918	3.849	.069	2.00
6302	Flour, first grade	3.839	3.813	.026	.23
6303	Flour, second grade	3.892	3.843	.049	.29
6304	Middlings	4.169	4.023	.146	4.80
6305	Bran	4.163	3.933	.430	7.32
....	Wheat	3.922	3.833	.089	2.54
6296	Flour, first grade	3.768	3.679	.089	.16
6297	Flour, second grade	3.780	3.701	.079	.27
6299	Middlings	4.115	4.005	.110	3.20
6298	Bran	4.142	3.946	.196	7.18
6270	Wheat	3.987	3.892	.095	1.96
6273	Flour, high grade	3.942	3.864	.078	.33
6279	Flour, low grade	4.365	4.218	.147	2.47
6280	Middlings	4.350	4.075	.275	9.62
6281	Bran	4.196	3.900	.296	10.07

A very brief inspection of the table will show that the differences noted stand in very intimate relation to the amount of crude fiber present, and leads to a suspicion that the fiber is the disturbing element. If this be true we should expect to find the greatest difference between the determined and caluculated heats of combustion in those materials which are especially rich in fiber, such as the coarse fodders and feces of herbivorous animals. The following results of feeding experiments with sheep serve to illustrate this.

Laboratory number.	Fodders and Feces.	Crude fiber.	Heats of Conbustion. Determined.	Heats of Conbustion. Calculated.	Heats of Conbustion. Difference.
		%	Calories.	Calories.	Calories.
4130	Oat hay..	30.74	4.209	3.719	.490
4131	Sheep feces from oat hay	33.65	4.290	3.682	.608
4160	Clover silage	33.43	4.184	3.638	.546
4161	Sheep feces from clover silage	32.16	4.379	3.805	.574
4202	Oat and pea silage	31.12	4.209	3.984	.225
4204	Sheep feces from oat and pea silage	32.88	4.163	3.669	.494

The results given in the last column are not, however, proportional to the amount of crude fiber present, but are much greater in the feces. This suggested a study of the fiber itself. A quantity was prepared from both fodders and feces and burned in the usual manner. The results, reduced to a water- and ash-free basis are given here.

HEATS OF CONBUSTION OF CRUDE FIBER FROM FODDERS AND THEIR FECES CORRESPONDING.

Lab. No.	Source of crude fiber.	Heats of conbustion.	Lab. No.	Source of crude fiber.	Heats of conbustion.
4130	Oat hay	4.405	4131	Feces from oat hay ..	4.662
4160	Clover silage	4.610	4161	Feces from clover silage	5.215
4202	Oat and pea silage ...	4.667	4204	Feces from oat and pea silage	4.820
	Average	4.561		Average	4.899

The crude fiber from the feces had, in these three cases, an average determined fuel value over 7 per cent higher than that of the fiber from the corresponding fodders. In other words, the digestible crude fiber had a lower fuel value than that remaining in the feces, and consequently, lower than that of the mixture of carbohydrates included in that term as found in the original fodders.

EXPERIMENTS WITH INSECTICIDES UPON POTATOES.

Chas. D. Woods.

Through the generous coöperation of Mr. John Watson of Houlton the Station has been able to make under exceedingly favorable conditions field experiments upon the potato. Not only did Mr. Watson give the free use of land, but he also furnished the labor and machinery. The management of the Bangor and Aroostook Railroad, with their characteristic interest in and support of all that has for its aim the improvement and development of Aroostook county, furnished free passenger transportation to a large amount. Because of this help the Station was enabled to make a series of experiments which it could not otherwise have undertaken.

Experiments as follows have been carried to a successful issue:

1: A soil test experiment of 25 plots.

2. An experiment of 25 plots on the effect of fertilizers, particularly different potash salts, upon the starch content of the potato.

3. A spraying experiment with Bordeaux mixture and other fungicides for potato blight.

4. An experiment with several commercial insecticides in comparison with Paris green as a remedy for the potato beetle.

The experiments with insecticides are here reported. The others will be prepared for publication as early as practicable.

For the experiment with insecticides, Mr. Watson kindly placed a ten acre field of fairly uniform slope and soil at our disposal.

This field was planted with Green Mountain potatoes late in April, the rows running east and west. There were 224 rows about 30 rods long running across the field, and in addition about 20 shorter rows at the north and ten at the south ends of the field. The piece was divided in this way into 14 plots of 16 rows each with 2 plots of shorter rows at either end. The short rows were untreated except that Paris green and whitewash were sprayed on these July 27th so as to kill most of the bugs. The arrangement of the plots and their treatment is shown in the following plan:

ARRANGEMENT OF PLOTS.

Each plot consisted of 16 rows about 30 rods long. The rows ran east and west. Row 1 at north end.

No. of rows.	Kinds of Insecticides.	Rate per acre at each application.
		Pounds.
1 to 17	Paris green	½
17 to 32	Boxal (arsenate of lead as the poison)	5
33 to 48	Boxal (arsenate of lead as the poison)	10
49 to 64	Paris green	½
65 to 80	Paragrene	½
81 to 96	Paris green	½
97 to 112	Swift's arsenate of lead	1
113 to 128	Arsenoid No. 2	½
129 to 144	Paris green	½
145 to 160	Arsenoid No. 3	½
161 to 176	Paris green	½
177 to 192	Arsenoid No. 4	½
193 to 208	Arsenoid No. 5	½
209 to 224	Paris green	½

DATES OF APPLICATION.

The insecticides were applied under the immediate oversight of the writer, with water together with a fungicide, either Bordeaux mixture, or other similar materials, in the form of a fine spray at the folowing dates:

July 11, rows 1 to 128; July 13, rows 129 to 224; July 21, rows 1 to 224; July 27, rows 1 to 224; August 10, rows 1 to 112, and August 11, rows 113 to 224.

The experiment was visited by the writer at least once a week during the growing season, and two or three days after each application each plot was carefully examined and full notes taken.

THE APPLICATION OF PARIS GREEN AND OTHER POWDERED INSECTICIDES.

When Paris green was first used for the potato beetle it seems to have been applied dry. This was probably partly due to the difficulty of transporting the water and partly (and perhaps more especially) to the imperfect distribution which resulted from sprinkling the plants with watering cans. Since the introduction of improved spraying machinery, the poisons can be more evenly and effectively distributed with water than by dusting.

None of the poisonous powders are dissolved in the water but are mixed with it and held suspended. The heavier the powder and the coarser the particles the greater will be the tendency for it to settle in it. An efficient agitator is an indespensible part of a spraying outfit. The materials are best applied as a fine spray, as in this way the whole plant can be readily covered and practically none of the solution runs off the foliage. In the case of the copper compounds of arsenic, freshly slacked lime should be added to the water at the rate of 2 pounds to barrel.* This will make the Paris green, etc., adhere better and effectually prevent burning the foliage. Half a pound of good, finely pulverized Paris green can be sprayed on so as to be more effective than a much larger amount applied with a "gun" or other dusting devices. It can also be applied much faster and with less labor. One man with a 4-rowed mechanical sprayer can readily treat 20 acres a day, and 30 acres with a 6-rowed sprayer.

In the experiments here reported upon, the poisons were all applied with a four-rowed mechanical sprayer fitted with a powerful hand pump. As it was desired to take every precaution for thorough spraying, two men were on the cart, one to pump, the other to drive and watch that the nozzles did not get stopped. In the first spraying one Vermorel nozzle was over each row and the rows were gone over twice in opposite directions. The other three applications were made with a double Vermorel nozzle. A barrel of spraying materials with two single or one double nozzle for each row will spray an acre. Some power mechanical sprayers, such as the Aspinwall, do not have

*In case the plants are sprayed with Bordeaux mixture at the same time, the addition of the lime is not necessary.

a sufficiently powerful pump to use double nozzles, and on this account are not well adapted to practical spraying in a potato growing district.

RESULTS WITH INSECTICIDES.

While experiments at this time included only Paris green, arsenate of lead, Paragrene and the arsenoids, notes are here given on other insecticides which are used to a greater or less extent in the State.

PARIS GREEN.

Since the advent of the Colorado potato beetle, Paris green has been the favorite and indeed practically the only insecticide used. According to the U. S. Dispensatory, Paris green is the aceto-arsenite of copper and "is made by mixing 5 parts of verdigris with sufficient water to form a thin paste, and adding to this a boiling solution of 4 parts of arsenious acid in 50 parts of water, keeping the mixture at the boiling temperature and adding a little acetic acid to cause it to retain a brilliant color." The pure aceto-arsenite of copper should carry 58.65 per cent of arsenious oxide. There is also another compound sometimes sold under the name of Paris green which is practically the arsenite of copper and theoretically carries 52.94 per cent of arsenious oxide. (See arsenoids beyond.)

Formerly Paris green was used only as a pigment and the first aim of the manufacturer was to produce a good bright green. Since its use as an insecticide the consumption has greatly increased and different manufacturers have modified the process of manufacture so that in many instances they differ quite widely from that outlined above. In at least one plant the green is made from copper oxide, arsenious acid, and a soluble acetate. The ingredients used will always contain varying amounts of impurities and on this account very little, if any, Paris green is strictly pure aceto-arsenite of copper. As the arsenious acid is the cheapest single constituent, the claim made by one manufacturer that "as long as the green is pure, the manufacturer will endeavor to get as much arsenic into it as possible, consistent with making a good bright green," is probably true. So-called "pure" Paris greens which do not bear evidence of adulteration have been found to carry as little as 47 per cent of arsenious acid and others have carried as high as 68 per cent. In the case of the goods with the low percentage, the relatively small amount of arsenic is due to impurities of the materials. In the case of green carrying more than 58.5 per cent of arsenious acid, the higher arsenic content can only be explained by their having an excess of uncombined arsenious acid (white arsenic). As white arsenic burns foliage much more than does Paris green, or even London purple, its presence in Paris green is objectionable. The purity of a Paris green is not necessarily indicated by its arsenic content since an excess of uncombined white arsenic is nearly as dangerous an adulterant as the presence of inert foreign matter. When pure, Paris green should have at least 50 per cent of arsenious oxide and should be practically free from uncombined arsenic. Important as the purity of the green is, its mechanical condition is of great moment. To thoroughly protect the plant it is necessary that the poison be thoroughly distributed. It follows therefore that of two equally pure greens, the one that is in the finer powder will prove the more effective. In our experience there is greater danger of purchasing imperfectly pulverized, than adulterated Paris green.

The purity of Paris green can be quite readily and fairly accurately tested by dissolving the Paris green in strong ammonia water. If pure all of the Paris green will dissolve, the solution turning a deep blue color. Undissolved sediment indicates impurities or adulteration. Another test is to place a little of the Paris green between two pieces of window glass and rub them together. If the Paris green is adulterated with lime, barium sulphate, or similar white materials, the Paris green will appear to turn white in places. Paris green of good quality is intensely bright green and uniform. When adulterated, the green loses something of its intensity and is grayish green and is not always uniform.

In the experiments here reported upon, Paris green was used in connection with some form of Bordeaux mixture in all of the check plots.

The Paris green was applied at the rate of one-half pound to the acre. The first application was made before any of the eggs had hatched and may have been unnecessary. The three applications of Paris green at the rate of one-half pound to the acre kept the bugs so reduced in numbers that they did no appreciable damage to the vines, and the fourth application (August 10-11) was unnecessary. The green was as usual somewhat difficult to keep thoroughly and evenly suspended in the water. When applied with lime at the rate of ½ pound of Paris green and two pounds of lime to the acre, the Paris green was more effective than when applied at the same rate with copper, (Bordeaux mixture). The copper appeared to be distasteful to the bugs and they would leave the thoroughly sprayed leaves for those that had less copper and in this way they avoided the leaves with the most Paris green. If vines are sprayed before the bugs have made much growth, there is no difficulty in keeping them in check, so they can do no harm, with two or three applications of Paris green at the rate of ½ pound to the acre. Applied at this rate with Bordeaux mixture or lime, there is no danger of burning the foliage.

LONDON PURPLE.

London purple was first introduced in this country as an insecticide in 1877. It is a waste product in the manufacture of some dye stuffs and consists largely of arsenic, lime and the dye. It is cheaper than Paris green, contains more arsenic and can be more easily applied.

Its composition is not so uniform, and it is more apt to injure foliage so that on the whole Paris green has been preferred. It was not used in the experiments here reported upon. Paris purple and English purple are two preparations quite similar in character to London purple. When any of the purples are used as insecticides they should be used with two or three times their weight of lime because of the soluble arsenic which they contain.

PARAGRENE.

Paragrene is a patented article which claims to be free from many of the objectionable features of Paris green. The manufacturers state that "Paragrene is a definite compound of arsenic, sulphate of copper and lime and is made in such a way as to neutralize whatever effect the acids, necessary to prepare the ingredients, would have on plant life." It has recently been analyzed by the California Agricultural Experiment Station and found to contain 23.46 per cent of copper oxide and 40.60

per cent of arsenious oxide, 23.08 per cent of which is free. It also contains 19.31 per cent of gypsum to add weight. Because of its large amount of free arsenious oxide it would be apt to burn the foliage of tender plants. On such a plant as the potato and in the small quantity used mixed with lime or Bordeaux mixture, the burning by this amount of free arsenic would not be likely to be great. It was applied four time with Bordeaux mixture at the rate of one-half pound per acre to rows 65 to 80. The field notes follow.

July 11, potatoes just beginning to bloom, no slugs hatched yet, sprayed; July 21, sprayed; July 24, very few bugs, none on coated or eaten leaves; July 27, sprayed; August 1, practically no bugs; August 8, practically no bugs; August 10, sprayed; August 14, no bugs; August 23, a few leaves are browned and curled on *edges;* no spots as in blight; appear to be slightly burned; September 4, the "burning" has made no progress.

The Paragrene used in this experiment was coarser than Paris green and when wet up with water there was quite a little residue left that would not go through a fine Vermorel nozzle. The attention of the company was called to the coarseness of the sample we used and in explanation they write as follows: "This is no doubt due to the rent or tear in the mill in which it is bolted. Sometimes this is bound to occur and a lot will go through the bolter before it is discovered, but we can assure you it is only an accident and instead of being coarse and gritty, the goods are always as fine as it is possible to get the best grade of flour."

In this experiment Paragrene proved as effective as Paris green and in the amount used did not burn the foliage so as to injure it, if at all.

ARSENOIDS.

Under the general name arsenoids quite a number of different arsenites have been placed upon the market. White arsenoid was supposed to be barium arsenite, but all of its arsenious acid was free so that it was no better than white arsenic diluted with baryta. Pink arsenoid is arsenite (not arsenate) of lead. A sample examined by the California Station* carried 40 per cent of combined and 3¼ per cent of free arsenious acid. The green

* Bulletin No. 126.

arsenoid or arsenite of copper has been quite extensively introduced by the Adler Color and Chemical Works. A sample examined by the California Station was found to carry 53½ per cent of combined and nearly 8 per cent of free arsenious oxide. As previously stated, copper arsenite if pure would carry about 53 per cent of combined arsenious oxide.

The Adler Color and Chemical Works are experimenting with different arsenoids with the hope of obtaining compounds which will be as effective and at the same time cheaper than Paris green. Four of these materials called Arsenoids Nos. 2, 3, 4, and 5 were used in these experiments. In each case they were applied four times with Bordeaux mixture at the rate of one-half pound of arsenoid to the acre.

The manufacturers make the following statements to us relative to these materials.

"No. 2 arsenoid is a compound containing arsenious acid, copper and lime and is made by treating arsenite of soda with sulphate of copper and lime. This gives an absolutely neutral combination of salts which is not likely to do any damage to foliage even when used in very strong solution. Could be sold for about 8 cents per pound. We have hopes that this will prove in every respect a most desirable insecticide.

"No. 3 arsenoid is made by treating a solution of acetate of lead with arsenate of soda and at the same time making an admixture of arsenite of copper. Cost of this would be about 14 cents per pound.

"No. 4 arsenoid is made by precipitating acetate of lead with arsenate of soda and at the same time adding arsenite of soda precipitated with lime, along with an admixture of arsenite of copper. The resulting compound consists of arsenite of lead, arsenite of lime and some arsenite of copper. This could be sold for about 10 cents per pound.

"No. 5 arsenoid is made by precipitating arsenite of soda with sulphate of copper and lime, producing an arsenite of copper and lime. This could be sold for about 10 cents per pound."

There was not much difference to be seen in the way the different arsenoids acted. None of them at the rate used burned the foliage and they all killed the bugs practically as well as Paris green. The arsenoids are more bulky and on this account are more readily kept in suspension than Paris green. The field notes show the arsenoids to have been about as effective as Paris green but not so effective as the arsenate of lead. While they may contain more free (uncombined) arsenious acid than the best made Paris greens, they probably contain no more than the average Paris green. There is little reason for using them instead of Paris green unless they can be had at a considerable lower price.

ARSENATE OF LEAD.

The Massachusetts Gypsy Moth Commission have during the past ten years made exhaustive comparative studies of different arsenical compounds as insecticides. In 1893 Mr. F. C. Moulton, a graduate of the Chemical Course of the University of Maine, was employed by the commission and suggested the use of arsenate of lead as an insecticide. It was found to be "the most effective poison yet used" and for the last year or two of the commission it was employed almost exclusively. The findings of the commission are summarized as follows:*

"Although nearly all poisons known to us which can be used as insecticides have been experimented with during the past five years in the hope that something would be found which would prove fatal to the gypsy moth, only one which is more effective than Paris green has been discovered. This is arsenate of lead, a poison slower in its action than the other, but which has three distinct advantages: (1) It can be used at any desired strength without serious injury to the foliage; (2) It is visible wherever used, as it forms a whitish coating on the leaves; (3) It has adhesive qualities, given it, probably, by the acetate of lead, and therefore remains on the leaves for a much longer period than Paris green. When sufficient glucose was added to a strong mixture of arsenate of lead, it withstood rainstorms and remained on the foliage during an entire season."

The arsenate of lead used by the commission was prepared, for the most part, by using 30 parts of arsenate of soda and 70 parts of acetate of lead. Prof. C. H. Fernald directs that arsenate of lead can be prepared in the proportions of 11 ounces of acetate of lead, and four ounces of arsenate of soda. The materials are

*The Gypsy Moth, Forbush and Fernald published by the Massachusetts Board of Agriculture, pages 141 and 142.

dissolved separately in water and slowly poured together with stirring.

Arsenate of lead is made by William H. Swift & Company, Boston, Mass., and the Bowker Chemical Company also of Boston. The latter company sell the goods under the name of Disparene. The chemist of one of the companies was for several years with the Gypsy Moth Commission and while with them constantly urged farmers to make arsenate of lead by the above formula and use it as an insecticide. Because of this we asked him why he now recommends the consumer to buy the "ready made" instead of using "home made" arsenate of lead. His reply (in part) is as follows:

"Between the years 1896 and 1899 Prof. C. H. Fernald and I, as opportunity offered, preached faithfully the gospel of home made arsenate of lead to our fruit growers and farmers. We had to do this. There was no one making it. As a result of these continued efforts not more than 15 or 20 farmers tried it. Most of them found it too expensive; many of them injured their foliage because of poor chemicals, wrong formula or improper mixing.

"The objections to the use of the home made article are the difficulties attending its manufacture. The more important are:

"To obtain arsenate of soda free from adulteration. In our experience in the gypsy moth work we were greatly bothered with adulterated arsenate of soda. Made as it generally is, by the use of rock salt, there is more or less of the latter left in the arsenate of soda. When mixed with a solution of lead salts, the sodium chloride acts first, forming lead chloride, which has no value as an insecticide; later, the arsenate of soda reacts, but often there is not lead enough allowed for the complete neutralizing of the latter. This leaves soluble arsenic in the mixture and "burned" foliage results. We went over the ground fully in our gypsy moth work and finally had to import arsenate of soda from England in order to get a pure article.

"The establishing a correct formula. Commercial arsenates of soda vary from 50 per cent to 98 per cent in purity. The ordinary formula, 11 ounces sugar of lead to 4 ounces arsenate of soda applies to the 50 per cent article. For the 65 per cent, less arsenate of lead must be taken; for the 98 per cent, still less.

The farmer must know the grade of goods he is working with and establish a new formula with each change of percentage."

The experience of the other company is practically the same. In answer to the question why ready made was superior to home made arsenate of lead, they said (in part) as follows:

"In regard to your inquiries regarding the manufacture of arsenate of lead, would say that it is made from arsenate of soda with either acetate or nitrate of lead. Each salt is dissolved separately, filtered and the solutions added together, when arsenate of lead precipitates out chemically. It is very necessary to have exactly the right proportions of the two salts, as an excess of either (particularly the arsenate of soda) will burn the foliage. As commercial arsenate of soda runs from 50 per cent to 68 per cent arsenious acid and acetate of lead varies somewhat, the correct proportions cannot be obtained without a chemical analysis.

"The remarkable adhesiveness of arsenate of lead is principally due to the extreme fineness of the particles in the precipitate. This we have been able to obtain only by a great many experiments to find the right conditions.

"Both arsenate of soda and acetate of lead are deadly poisons, and would be much more dangerous to have around than a disinfectant plainly marked, and understood to be poisonous.

"Taking all these facts into consideration, in our opinion the making and use of arsenate of lead by persons without a chemical knowledge would be dangerous and unsatisfactory."

While both of these companies have made the difficulties of preparation fully as great as they really are, there is no doubt that the average man had far better buy prepared arsenate of lead than attempt its manufacture.

As sold, arsenate of lead (including disparene) is put up in paste form, and carries from 60 to 70 per cent of arsenate of lead.

In the experiments here reported upon Swift's arsenate of lead and Bowker's boxal (in which the poison is lead arsenate) were used. Disparene was sent, but it was received too late to be used for the first spraying.

Swift's arsenate of lead. Rows 97 to 112 were treated four times with Bordeaux mixture and Swift's arsenate of lead at the rate of one pound to the acre. The field notes are as follows:

July 11, potatoes beginning to bloom, no slugs hatched yet, sprayed; July 21, sprayed; July 24, practically no bugs, less than on any other plants; July 27, sprayed; August 1, with the exception of three hills the north side of which was missed in spraying, only two bugs were seen in the whole length (30 rods) of 4 rows; August 8, practically free from bugs; August 10, sprayed, it began to sprinkle as this was being applied, only a light shower, but did not clear off; August 14, no bugs.

Boxal as an Insecticide. Boxal is a "concentrated Bordeaux mixture, reenforced with copper hydrate for the prevention of blight and sufficient arsenic for killing leaf-eating insects." The arsenic is in the form of arsenate of lead. It was applied in these experiments four times at the rate of 5 pounds, and in another plot at the rate of 10 pounds of boxal to the acre. The field notes are as follows:

Rows 17-32, boxal at the rate of five pounds to the acre. July 11, potatoes just beginning to bloom, no slugs hatched yet, sprayed; July 21, sprayed; July 24, bugs more numerous than on rows 1-16 (Paris green) but no badly eaten plants; July 27, sprayed; August 1, bugs less than on rows 1-16 (sprayed with Paris green); August 8, a few bugs, about the same as on rows 1 to 16; August 10, sprayed; August 14, very few bugs,—none except on here and there a plant.

Rows 33 to 48. Boxal at the rate of 10 pounds to the acre. July 11, potatoes just beginning to bloom, no slugs hatched yet, sprayed; July 21, sprayed; July 24, bugs about the same as on rows 1 to 16, no living bugs on eaten leaves; July 27, sprayed; August 1, very few bugs and then only on occasional hills, no need of further spraying for bugs; August 8, practically no bugs; August 10, sprayed; August 14, no bugs.

In this experiment spraying four times with boxal at the rate of five pounds to the acre and three times at the rate of ten pounds to the acre kept the bugs from doing any damage. The larger application was the more effective.

Disparene. Disparene is a paste of arsenate of lead and "contains from 62 to 68 per cent of arsenate of lead." As previously stated it was received too late to be used in the experiment. It was however applied to a piece of 3 or 4 acres which had been sprayed twice with Paris green without killing off the bugs as much as was desirable. The spraying with disparene was effective and cleared the field from bugs.

Disparene was used by several farmers in the vicinity of Houlton and, in some instances, the results were not satisfactory. From our experience with arsenate of lead the trouble would seem to be in the application rather than in the poison itself.

SUMMARY.

Arsenate of lead was used at the rate of one pound to the acre and in the case of boxal much less than that. It is very readily mixed with water and stays in suspension so that it is possible to apply it much more evenly than Paris green. It adheres well to the foliage and is the most effective of any of the insecticides tried.

BUG DEATH.

The Danforth Chemical Company of Leominster, Mass., have put upon the market a preparation for which they make great claims and for whose merits some users fail to find language too strong in which to extol the goods. The advertising circular of 1900 says:

"The farmers who used Bug Death freely the past season on potatoes had a large crop of good smooth potatoes that actually brought a higher price in the market than those of their brother farmers who did not use Bug Death, but who did use some of the many insecticides that contain arsenic.

"Why should you feed your crops on a deadly poison? Is it not better to feed them with something that is a plant food, as well as an insecticide, thus freeing the plant of the insects and promoting growth, which increases yield and improves quality, especially when blight is prevalent? If used according to directions the extra yield will more than pay the entire expense.

"If you have made a test of it we rest assured that you will be a permanent customer. If to you it is new or unheard of we ask that you read these testimonials which, coming as they do from prominent dealers (all of whom are well and favorably known to the people of their respective states), will, we are sure, induce you to at least give Bug Death a trial, and then we are confident that the practical results derived from its use will convince you of its merits."

Following this are a large number of testimonials from dealers and others of the wonderful results which followed the use of Bug Death in 1899.

This Station has not made an analysis of Bug Death but it was analyzed by the N. Y. (Cornell) Station in 1898 and found to consist of zinc oxide 76.5 per cent, lead oxide 9.8 per cent, iron oxide 7.8 per cent, small amounts of silica, chlorine, potash and a trace of phosphoric acid.

In May we wrote the Danforth Manufacturing Company, as we did all other manufacturers whose goods we proposed testing in the field and received a letter from the superintendent saying: "We are desirous of having our good tested this year." He stated that he was to be in Maine in the near future and that he would call and talk the matter over. The latter part of June he called at the Station. The interview was a pleasant one and while we expressed doubts as to the goods doing what was claimed for them, the whole experiment was explained to the superintendent and he went away saying that personally he would like to have the trial made but that he would have to consult with his associates. Under date of June 26th he wrote as follows: "The writer has conversed with other members of our firm in regard to entering the competition test at Houlton, and we have decided not to go into it this year."

After the spraying experiment was well under way we learned more as to the large sales of Bug Death that were being made in Maine and decided to give the goods a trial. Near the large experimental field was a small plot (about ¼ of an acre) used by the former owner of the place as a garden which was planted to Green Mountain potatoes. About half of it was treated with Black Death and later with Paris green and the remainder with Bug Death.

The directions for application of Bug Death are as follows:

"For potato and other plants or vines which require a top application, apply dry with Perfection shaker at the rate of 12½ pounds or more per acre to an application, acording to size and condition of the vines. Dust the plants thoroughly and pleasing results will follow."

THE FIELD NOTES ARE AS FOLLOWS:

July 23, five pounds of Bug Death (at the rate of 40 pounds per acre) applied. Bugs in all stages of growth, but not very numerous.

July 24, bugs not very numerous but apparently happy. Many feeding on eaten plants and no signs of disturbance and no dead ones on the ground. Diligent search failed to show a single dead beetle or slug or a badly eaten plant cleared. Five pounds more (a total of 80 pounds per acre) applied.

July 25, heavy rain.

July 27, bugs numerous. Decided to give up use of Bug Death but the superintendent of the Danforth Chemical Company arrived before the plot was treated with Paris green, and at his desire the piece was treated with one package (12½ pounds) or at the rate of 100 pounds per acre. This was applied with the Perfection shaker and it took one man a little less than an hour and a half to apply it.

August 1, bugs practically all gone. No dead ones to be seen. A few leaves that look as though they had been burned. There was a heavy shower last night and the Bug Death appears to be practically all washed off.

August 7, practically no bugs.

August 14, some bugs but less than on the part treated (one application, July 27) with Paris green. The edges of some leaves, especially at east end, are brown. It does not look like blight but more as if they had been burned.

August 18, blight beginning to appear but considerably less than on other part of piece. Burned leaves are more conspicuous than on the 14th.

August 23, burned leaves still more conspicuous, chiefly at east end. Some bugs and blight but not nearly as many or as much as on other part of the piece.

August 31, pretty generally affected with blight, although not so bad as other part. The so-called burned leaves are practically all dead. They died from the margin of the leaf towards the center. Very different from the way that the other plants have acted with blight.

September 4, much the same as on August 31. Blight still making some progress.

September 7, heavy frost which practically put an end to growth.

That there might be no confusion between the action of the Paris green and the Bug Death, two unsprayed rows were left between the two parts of the piece. On August 1 it was noticed that these two rows were badly infested with slugs and beetles, and that there were very few bugs on the part sprayed with Paris green. In the light of the experiments in the greenhouse, described beyond, the great number of bugs on these untreated rows was probably due to their being driven by the Bug Death.

EXPERIMENTS WITH BUG DEATH IN THE GREENHOUSE.

The heavy application (at the rate of 100 pounds to the acre) cleared the vines to which it was applied from bugs. Practically no dead bugs were found in the field and the superintendent of the company said that they very seldom found dead bugs under the plants, but that it cleared the vines when applied in sufficient quantities. In order to observe the effect of the Bug Death more carefully and accurately than is possible in a field test, potato plants were transplanted into the greenhouse in pots and the following experiments made, under the oversight of LeRoy H. Harvey.

The experiments with Bug Death were carried on as four distinct experiments. The potato plants were divided into four groups; each group being separated from the others and enclosed by mosquito netting. The treatment of each group and the observed results follow. The treatment began at 10 A. M.

FIRST EXPERIMENT.

Statement of Conditions. Three plants were taken. One plant was thoroughly covered with potato slugs, and they were allowed to remain unmolested until they were feeding freely. Then a liberal quantity of Bug Death was uniformly dusted over the plant with the slugs.

Results: Within half an hour after the application, the slugs were noticed to be crawling onto the underside of the dusted leaves which were free from the Bug Death.

After 6 hours a few of the slugs had left the treated plant and crossed over to undusted ones, and in so doing were obliged to climb over a piece of pasteboard 6 inches high which separated the undusted from the dusted plants. On the ground under the dusted plant were observed 3 dead slugs.

After 22 hours a few more were found dead under the dusted plant. More than half of the slugs had been driven from the plants even forcing themselves out from under the netting. In their eagerness to get away they left the plants which were free from the Bug Death. Clinging to the leaves of the dusted plant were a few slugs which on being touched fell to the ground. Although apparently alive, they were dead.

After 28 hours not much change was noticed, except a few more driven and the remaining ones were apparently in a sort of stupor.

After 52 hours all the slugs were driven from the upper part of stalks. A few were observed apparently feeding at the base of the plants.

After 68 hours about a third of the remaining few had crossed over to the undusted plants. Those remaining on the treated plant were eating heartily on the lower leaves, which had not been reached in the dusting. No stupor was noticeable.

The plants were allowed to remain several days after the sixth observation, but nothing further of note was observed.

SECOND EXPERIMENT.

Statement of Conditions. In this experiment three plants were also taken. One plant was dusted as well and evenly as possible and then covered with the slugs.

Results: The slugs almost immeditely and collectively sought the underside of the treated leaves.

After 6 hours several of the slugs were observed on the undusted plants to get to which they must have, as in No. 1, climbed over a strip of pasteboard 6 inches high separating the dusted from the undusted plants. Five slugs had succumbed to the Bug Death.

After 22 hours nearly three-fifths of the slugs had been driven from the treated plant forcing themselves under the netting and escaping, as in No. 1, in preference to going on to the untreated plants. A few dead slugs were seen clinging to the branches.

After 28 hours there was a slight increase in the number of dead. The same semi-stupor apparent in the corresponding observation in No. 1 was here also evident.

After 52 hours a few more bugs had left the treated and crossed over to the undusted plants.

After 68 hours only a few bugs were remaining and these were eating heartily on the basal leaves, the stupor apparently having passed away.

Nothing of importance was observed in the following three days at the end of which time the experiment was discontinued.

THIRD EXPERIMENT.

Statement of Conditions. The four plants which were taken in this group were all first thoroughly wet with water, then liberally sprinkled with Bug Death. The operation was repeated, first wetting and then sprinkling, until the leaves were evenly covered with Bug Death, and there was no dust apparent as such. The plants were next freely covered with slugs.

Results: As in experiments Nos. 1 and 2 the slugs soon sought the underside of the leaves.

After 6 hours a few of the slugs were noticed making their escape from under the netting and four were found dead under the plants.

After 22 hours there were a few more dead under the plants. There was a general leaving of the upper leaves for the basal. Almost half of the insects were driven as in previous experiments.

After 28 hours no marked change was noticed. A few more bugs had gone to the base of the leaves, and the semi-stupified condition was becoming evident.

After 52 hours there were only a few slugs left on the vines, the others apparently have been driven away.

After 68 hours the few remaining bugs were feeding freely on the basal leaves. The semi-stupor was not apparent.

During next three days no change was observed and the experiment was discontinued.

FOURTH EXPERIMENT.

Statement of Conditions. This experiment differed from No. 1 only in that *all* the plants were first covered with slugs and then very liberally dusted with Bug Death.

Results: As in the three preceding experiments the slugs as soon as dusted started for the under side of the leaves and within an hour not a slug was left on the surface of the leaves.

After 6 hours a few dead slugs were found under the plants. Several had already started to escape.

After 22 hours several more dead slugs were found under the plants. Nearly one-half of the slugs had made good their escape by forcing themselves under the netting.

After 28 hours the number of the remaining slugs was somewhat decreased. The semi-stupor noticed in the corresponding observations of experiments Nos. 1, 2, 3, was also here slightly noticeable.

After 52 hours no change was noticeable. The few remaining slugs were feeding on the under side of the lower leaves.

After 68 hours only two slugs were remaining on the plants, and these were feeding on the basal leaves. The slugs showed no sign of any stupor.

During the three following days no observation worthy of record was made and so the experiment was discontinued.

Summary of the results. The effect most noticeable upon the bugs from the application of the Bug Death is its great driving property. The principle exodus of the slugs took place during the first night, and the subsequent escapings were also mostly made at night.

In the four experiments in the observations which took place after 28 hours, a semi-stupified condition was quite noticeable. The slugs would hang onto the under side of the leaves slightly curled up, apparently dead. When knocked to the ground they would slowly uncurl themselves and perhaps in an hour or so would be back again on the plants or more likely they would have made their escape under the netting. During the next forty-five hours there was an apparently complete recovery from the stupefaction. Only a small number of slugs were killed by the Bug Death. Whether these were killed by suffocation from the application of the powder or from being poisoned by eating the Bug Death, the experiments do not conclusively show. In the third experiment the death rate was about as in the other trials and here the attempt was made to get rid of the dust by wetting. Whatever value the material has is dependent upon the strong dislike which the bugs show for it, rather than to any insecticidal qualities which it may have.

THE COST OF BUG DEATH.

The price as advertised ranges from 15 cents for a single pound to 8 cents in the largest package which the company puts out. At the rate applied in these experiments it would cost $8.00 per acre for the material for each application. Two applications a fortnight apart would be needed to keep the potatoes free from bugs. When applied to vines not covering the ground an application at the rate of 40 pounds per acre was without effect, so it would seem that the second application must be as great as the first. To partly protect would cost for the Bug Death $8.00 per acre while to thoroughly protect against bugs would cost $16.00 for materials. The "Perfection Shaker" is a covered tin dish with small holes in the bottom. Applied with this shaker a man would be kept very busy and might develop a lame wrist in the attempt to apply 100 pounds in one day. In Aroostook county there are in the neighborhood of 25,000 acres of potatoes on which the bugs must be killed within a few days time. In the presidential election of 1896 the county polled 6,472 votes. It would take ten days for these voters to protect the potato plants from bugs applying Bug Death with the Perfection shaker. A farmer growing 20 to 50 acres would find it impossible to get the help necessary to apply Bug Death at the right time.

One pound of Paris green, or other arsenites applied at two different times will do all the work of 200 pounds of Bug Death. The Paris green can be applied with power sprayer at the rate of 20 to 30 acres a day, and a thorough application of Bordeaux mixture can be applied at the same time with only the added cost of materials (about 40 to 45 cents an acre). Reckoning a man's time at 15 cents an hour it would cost at least for materials and labor 18 dollars an acre to apply Bug Death twice. For two dollars and a half an acre can be treated four times with Bordeaux mixture and a reliable poison.

SUMMARY.

It is claimed for Bug Death that it acts as an insecticide, fungicide and fertilizer.

Bug Death is chiefly zinc oxide. It contains no nitrogen, a mere trace of phosphoric acid and a small amount of potash.

As an insecticide.

At the rate 100 pounds per acre it freed potato vines from bugs.

At the rate of 40 pounds per acre it had no appreciable effect.

Bug Death drives the bugs and makes them leave the vines.

Bug Death kills comparatively few of the bugs.

As a fungicide.

Blight did not appear as soon nor as badly on plants to which Bug Death was applied at the rate (in 3 applications) of 180 pounds per acre as on untreated vines.

Effect on foliage.

At the rate of 40 pounds per acre no appreciable effect.

At the rate of 100 pounds per acre some of the leaves curled on the edges and finally died.

As a fertilizer.

As its only fertilizing constituent is a little potash it was not tested as a source of plant food.

Its economy.

Because of its high cost and slow application, no one growing any considerable amount of potatoes can afford to use Bug Death. The price of the labor required to apply Bug Death to one acre will buy the materials and spray two acres with Bordeaux and Paris green.

BLACK DEATH AND ENGLISH BUG COMPOUND.

These two compounds have been quite extensively advertised and presumably more or less used in the State. Black Death is apparently Paris green diluted with gypsum to make weight and colored with charcoal. English Bug Compound depends upon white arsenic for whatever value it may have as an insecticide. Gypsum is employed to dilute the white arsenic and to give weight. As both of these goods depend upon arsenic as the poison, they are no safer to use than any other arsenical insecticide. The English Bug Compound was not used in these experiments. Black Death was applied once on one-fourth acre by the Station at the rate of 40 pounds per acre and it had no appreciable effect on the bugs.

Each of these mixtures are sold, considering their composition, at very high prices and are uncertain and expensive insecticides. If English Bug Compound does not burn foliage, it is only because the manufacturers have used largely of the cheaper plaster, and sparingly of the more expensive white arsenic.

PRACTICAL CONCLUSIONS.

In fighting the Colorado potato beetle no adequate substitute for arsenical poisons has yet been found and there is little hope that any will be found. The efforts are now limited to finding cheaper or more effective compounds of arsenic than Paris green.

The arsenical insecticides are best applied with water in the form of a fine spray as soon as the slugs appear. Unless applied in connection with Bordeaux mixture it is safest to use lime with all arsenical compounds. The applications should be repeated as often as necessary.

Some of the cheaper arsenoids were in these experiments as effective as Paris green. There is no reason for using them or Paragrene in place of Paris green unless they can be had at a lower price.

Lead arsenate is the most satisfactory of the insecticides used by the Station. It is apparently slower in action than the copper compounds of arsenic, but it can be more evenly applied and it adheres firmly to the foliage without burning.

DIRECTIONS FOR SPRAYING.

On application the following special publications of the Station will be mailed free:

Condensed Directions for Spraying the Potato.

Condensed Directions for Spraying Apples.

How to Fight Cucumber Enemies.

ACKNOWLEDGMENTS.

Acknowledgment is hereby made for the following gifts to the Station during 1900:

Chinese Artichokes, Artichokes from Italy, Seed Wheat, Seeds from Japan and Italy, Lawn Grass Seed from France—United States Department of Agriculture.

Carnations, Rooted Cuttings—Albert M. Herr, Lancaster, Pa.

Sulphate, Carbonate and Muriate of Potash and Kainit—German Kali Works, New York City.

Nitrate of Soda—Propaganda for Use of Nitrate of Soda, New York City.

Seed Potatoes—George W. P. Jerrard Company, Caribou.

Garden and Acme Corn Planters—Potato Implement Co., Traverse City, Mich.

Seat Spring for Farm Wagons—Cramer & Co., Bradley, Mich.

The following newspapers and other publications are kindly donated to the Station by the publishers:

Agricultural Epitomist, Indianapolis, Ind.

Agricultural Gazette, Sidney, New South Wales.

American Cultivator, Boston, Mass.

American Fertilizer, Philadelphia, Pa.

American Gardening, New York City.

American Grange Bulletin, Cincinnati, O.

American Grocer, New York City.

American Miller, Chicago, Ill.

Baltimore Weekly Sun, Baltimore, Md.

Bangor Weekly Commercial, Bangor, Me.

Beet Sugar Gazette, Chicago, Ill.

Breeders' Journal, Himrods, N. Y.

Canadian Horticulturist, Grimsby, Ont.

Chronique Agricole, Lausanne, Switzerland.

Country Gentleman, Albany, N. Y.
Dairy World, Chicago, Ill.
Detroit Free Press, Detroit, Mich.
Elgin Dairy Report, Elgin, Ill.
Farmer's Advocate, London, Ont.
Farmer's Guide, Huntington, Ind.
Farmer's Home, Dayton, O.
Farmer's Tribune, Des Moines, Iowa.
Farm Home, Springfield, Ill.
Farm and Home, Chicago, Ill.
Farm Journal, Philadelphia, Pa.
Farm-Poultry, Boston, Mass.
Farmer's Magazine, Springfield, Ill.
Farmer's Review, Chicago, Ill.
Farmer's Voice, Chicago, Ill.
Farming, Dayton, O.
Florists Exchange, New York City.
Florists Review, Chicago, Ill.
Forester, Princeton, N. J.
Fruit, Dunkirk, N. Y.
Golden Egg, St. Louis, Mo.
Green's Fruit Grower, Rochester, N. Y.
Hoard's Dairyman, Ft. Atkinson, Wis.
Holstein Friesian Register, Brattleboro, Vt.
Homestead, Des Moines, Iowa.
Horticultural Visitor, Kinmundy, Ill.
Inland Poultry Journal, Indianapolis, Ind.
Jersey Bulletin, Indianapolis, Ind.
Journal of the Royal Agricultural Society, London, England.
Louisiana Planter, New Orleans, La.
Lewiston Weekly Journal, Lewiston, Maine.
Maine Farmer, Augusta, Maine.
Mark Lane's Express, London, England.
Market Garden, Minneapolis, Minn.
Massachusetts Ploughman, Boston, Mass.
Mirror & Farmer, Manchester, N. H.
Modern Miller, St. Louis, Mo.
Montana Fruit Grower, Missoula, Mont.
National Farmer and Stock Grower, National Stock Yards, Ill.

National Rural and Family Magazine, Chicago, Ill.
National Stockman and Farmer, Pittsburg, Pa.
New England Farmer, Boston, Mass.
New England Florist, Boston, Mass.
New England Homestead, Springfield, Mass.
New York Farmer, Port Jervis, N. Y.
New York Produce Review, New York City.
North American Horticulturist, Monroe, Mich.
Northern Leader, Fort Fairfield, Me.
Northwestern Miller, Minneapolis, Minn.
Oregon Agriculturist, Portland, Oregon.
Pacific Coast Dairyman, Tacoma, Wash.
Park and Cemetery, Chicago, Ill.
Practical Dairyman, Spencer, Ind.
Practical Farmer, Philadelphia, Pa.
Practical Industry, Gouverneur, N. Y.
Public Ledger, Philadelphia, Pa.
Ruralist, Gluckheim, Md.
Rural Californian, Los Angeles, Cal.
Rural New Yorker, New York City.
Rural Topics, Morgan City, La.
Southern Farm Magazine, Baltimore, Md.
Southern Farmer, New Orleans, La.
Southern Planter, Richmond, Va.
Southwest, Springfield, Mo.
Southwestern Farmer, Wichita, Kans.
Strawberry Specialist, Kittrell, N. C.
Sugar Beet, Philadelphia, Pa.
Turf, Farm and Home, Waterville, Me.
Vick's Magazine, Rochester, N. Y.
Weekly Union, Manchester, N. H.
Western Agriculturist, Chicago, Ill.
Western Creamery, San Francisco, Cal.
Western Fruit Grower, St. Joseph, Mo.
The World, Vancouver, B. C.

METEOROLOGICAL OBSERVATIONS.

The instruments used at this Station are the same as those used in preceding years, and include: Wet and dry bulb thermometers; maximum and minimum thermometers; thermograph; rain-gauge; self-recording anemometer; vane; and barometer. The observations at Orono now form an almost unbroken record of thirty-one years.

The mean temperature for 1900 was about one degree above the average for 32 years. The greatest monthly variations from the average were in April and October, which were 3°.74 and 5°.55 respectively higher than usual. The total precipitation, 53.8 inches, was higher than that recorded at any one year at this Station since 1870, when the fall was 58.04 inches. The rainfall was very unequally distributed through the year, April being dry, while in May the fall was more than double the average, thus greatly delaying planting. July and August were so dry that crops in this section suffered greatly. Latitude, 44°, 54′, 2″ N. Longitude 68°, 40′, 11″ W. Elevation above the sea, 150 feet.

METEOROLOGICAL SUMMARY FOR 1900.
Observations Made at the Maine Experiment Station.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean.	Total.
Highest barometer	30.52	30.49	30.31	30.24	30.12	30.09	29.99	30.05	30.21	30.38	30.33	30.28	30.24	......
Lowest barometer	28.81	28.55	29.16	29.20	29.33	29.37	29.28	29.48	28.90	29.36	28.84	29.19	29.12	.....
Mean barometer	29.74	29.77	29.71	29.73	29.74	29.72	29.73	29.83	29.85	29.98	29.82	29.81	29.79	......
Highest temperature	46°	50°	52°	78°	83°	86°	89°	94°	93°	76°	72°	45°	....	......
Lowest temperature	—19°	—21°	—10°	21°	26°	38°	47°	43°	27°	19°	9°	—16°	....	......
Mean temperature	17°.82	20°.49	26°.58	44°.12	49°.49	63°.39	68°.10	66°.30	59°.37	51°.55	35°.90	18°.65	43°.46	......
Mean temperature for 32 years	16°.04	19°.28	27°.53	40°.38	52°.29	62°.03	67°.01	65°.10	60°.22	46°.00	34°.26	20°.31	42°.54	......
Total precipitation in inches	8.14	6.75	5.47	2.01	8.24	3.83	2.53	1.58	2.94	5.70	4.59	2.02	....	53.80
Mean precipitation for 32 years	4.37	4.15	4.24	2.82	3.64	3.62	3.33	3.57	3.35	4.07	4.44	3.73	......	45.33
No. of days with precip. of .01 in. or more	10	10	5	7	13	7	9	10	7	8	11	6	......	103
Snow fall in inches	26.30	23.00	16.50	....	....	....	....	....	......	....	7.75	11.75	....	85.30
Average snow fall for 32 years	23.20	21.80	17.10	5.80	....	......	....	....	....	0.93	7.80	16.80	....	93.43
Number of clear days	14	10	12	10	9	14	9	11	15	11	7	11	....	133
Number of fair days	4	2	8	5	8	5	11	9	6	8	7	4	....	77
Number of cloudy days	13	16	11	15	14	11	11	11	9	12	16	16	....	153
Total movement of wind in miles	5844	6920	8308	7137	6137	5063	5131	4665	4569	5452	6624	4549	......	......

REPORT OF THE TREASURER.

Maine Agricultural Experiment Station in account with the United States appropriation, 1899-1900.

DR.

To receipts from the Treasurer of the United States as per appropriation for the fiscal year ending June 30, 1900, as per act of Congress approved March 2, 1887		$15,000 00

CR.

By salaries:		
(a) Director and administration officers	$2,360 91	
(b) Scientific staff	3,666 68	
(c) Assistants to scientific staff	1,730 28	
(d) Special and temporary services	55 06	
Total		$7,812 93
Labor:		
(a) Monthly employees	$755 00	
(b) Daily employees	713 23	
Total		1,468 23
Publications		26 65
Postage and stationery		326 29
Freight and express		187 16
Heat, light and water		1,064 41
Chemical supplies:		
(a) Chemicals	$308 37	
(b) Other supplies	68 89	
Total		377 26
Seeds, plants and sundry supplies:		
(a) Agricultural	$66 95	
(b) Horticultural	160 52	
(e) Miscellaneous	418 93	
Total		646 40
Fertilizers		171 73
Feeding stuffs		1,107 02
Library		243 34
Tools, implements, and machinery		190 78
Furniture and fixtures		262 01
Scientific apparatus		58 37

Maine Agricultural Experiment Station in account with Creamery Inspection for the year ending December 31, 1900.

DR.

To fees for calibrating glassware	$53 34

CR.

By expense calibrating glassware	$53 34

Maine Agricultural Experiment Station in account with "General Account" for the year ending June 30, 1900.

DR.

To balance from 1898-9	$1,305 29	
Sales of produce, etc	3,857 20	$5,162 49

CR.

By salaries	$306 33	
Labor	1,397 66	
Stationery	8 04	
Heat, light and water	22 00	
Seeds, plants, and sundry supplies	1,009 70	
Feeding stuffs	41 93	
Tools, implements and machinery	2 70	
Furniture and fixtures	55 87	
Scientific apparatus	5 93	
Live stock	13 55	
Traveling expenses	11 75	
Contingent (chiefly insurance)	190 08	
Buildings and repairs	1,460 95	
Balance to 1900-1901 account	636 00	$5,162 49

Live stock:		
(a) Horses	$90 00	
(c) Sheep	18 00	
(e) Poultry	32 47	
(f) Sundries	211 77	
Total		$352 24
Traveling expenses:		
(a) In supervision of Station work	$162 12	
(b) In attending various meetings	135 40	
Total		297 52
Buildings and repairs:		
(a) New buildings		407 66
Total		$15,000 00

ISAIAH K. STETSON, *Treasurer.*

I, the undersigned, duly appointed Auditor of the Corporation, do hereby certify that I have examined the books of the Maine Agricultural Experiment Station for the fiscal year ending June 30, 1900, that I have found the same well kept and classified as above, and that the receipts for the year from the Treasurer of the United States are shown to have been $15,000.00, and the corresponding disbursements, $15,000.00; for all of which proper vouchers are on file and have been examined by me and found correct.

And I further certify that the expenditures have been solely for the purposes set forth in the act of Congress approved March 2, 1887.

A. W. HARRIS, *Auditor.*

Maine Agricultural Experiment Station in account with Fertilizer Inspection for the year ending December 31, 1900.

DR.

To balance from account of 1899	$253 69	
Receipts for licenses	2,555 00	$2,808 69

CR.

By collection and analyses of samples	$1,861 32	
Executive and office expenses	700 00	
Balance to account of 1901	247 37	$2,808 69

Maine Agricultural Experiment Station in account with Feed Inspection for the year ending December 31, 1900.

DR.

To receipts for inspection tags, 1900	$1,917 76	
Balance to account of 1900	666 53	$2,584 29

CR

By balance carried from 1899 account	$786 07	
Collection and analyses of samples	628 54	
Tags	469 68	
Executive and office expenses	700 00	
		$2,584 29

APPENDIX.

Annual Report of the State Pomological Society.

1900–1901.

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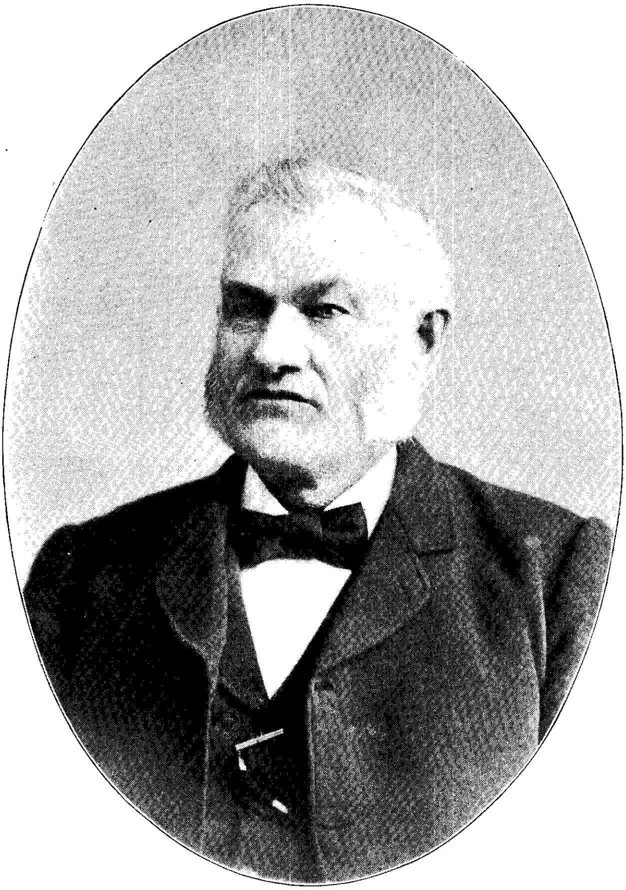


LYMAN F. ABBOTT

IN MEMORIAM.

LYMAN F. ABBOTT.

The death of Lyman F. Abbott, which occurred at his home in Lewiston, March 31, 1900, removes from our society one of its most reliable and valuable officers, and demands from us more than a passing notice.

From his boyhood Mr. Abbott had been closely connected with the farm and interested in everything that pertained to it; few men in the State were better known and more thoroughly trusted by the farmers.

He was the son of Nathaniel and Mary Stockbridge Abbott, and was born in Andover in 1830. Here he lived, engaged in farming till he was thirty-four years old, when he removed to Wilton. He remained in Wilton seventeen years, occupied in trade and farming. During his residence in Andover he began writing for the agricultural columns of the Oxford Democrat, and other papers.

In 1882 he became agricultural editor of the Lewiston Journal, which position he held until his death, and in addition to his editorial duties he frequently contributed to the leading agricultural papers, and also to the annual reports of the State department of agriculture. These articles covered a wide range of topics, for his interest was not limited to a few subjects. He was an enthusiastic entomologist, acquainted with the farmer's insect friends and enemies, following their life history through all its changes, and knowing when to check and when to encourage them.

Bee-keeping was a constant and fascinating study to him, and his papers on this subject were delightful reading. He was also greatly interested in stock-breeding, in the introduction of new breeds, and the improvement of the old standards by the infusion of new blood. Still another interest brought him in touch with our work. He was long a cultivator of flowers, and especially enjoyed the development of our beautiful native shrubs under his own care; the cultivation of small fruits was a pastime and a pleasure, while the larger problems of orchard management, pruning, fertilizing and tillage, presented an ever changing and widening field for study.

As an officer of the Pomological Society his unfailing kindliness and courtesy rendered him especially acceptable, while his devotion to its interests, his eager welcome of new and improved methods, and his constant efforts to enlarge its sphere of usefulness and influence, made him invaluable.

But his was an instance where the sum of his work was far below the measure of the man. Added to his intelligent mind and persevering industry was a personal affection, a sympathy that reached out to all humanity in its struggles and sufferings, the close, warm, human touch that uplifts and strengthens. Of a modest and retiring disposition, a strong religious faith and a singularly pure, upright life, all things beautiful in the natural world and all the sweetness, purity and nobility of human life touched in him a responsive chord.

To every appeal for sympathy and encouragement he gave of his best—himself—unselfishly and unsparingly, and was ever, in the highest sense of the word, a benefactor.

AARON LITTLEFIELD SIMPSON.

Aaron Littlefield Simpson was a native of Dixmont. His grandfather Simpson served in the French and Indian War, and marched through the wilds of Maine in Arnold's expedition to Quebec; he also fought with the colonists in the Revolution.

His father took part in the war of 1812. The subject of the present sketch saw service in the Aroostook War as corporal in Captain Hussey's company of volunteers, and helped build the fort at Fort Fairfield.

Having taken a course of legal study he was admitted to the bar in 1848, and practiced his profession in Bangor continuously until his death, February 7, 1901. The feeling of public confidence in him is shown by the fact that he served the community as member of the common council and of the board of aldermen, as chairman of the school committee, and for a number of years as city solicitor. In January, 1895, he was appointed by President Cleaveland collector of customs for the port of Bangor.

Mr. Simpson was a charter member of the Maine Pomological Society, chairman of the committee that called its first meeting and for several years its vice-president. He was also, for many years, president of the Bangor Horticultural Society. He was deeply interested in everything relating to horticulture and always cultivated in his own garden, apple, pear, plum and cherry trees, and the whole list of small fruits. In the culture, development and improvement of the strawberry he was an enthusiast, while the vegetables and flowers gave variety and delight to his gardening. To the end of his life he found in his garden an ever-new enjoyment and recreation from his professional labors, and here, every day, in rain or sunshine, he came in loving contact with nature, strengthened and uplifted by her healing touch.

INTRODUCTORY.

During the past year illness and death have made sad inroads in the ranks of our officers, and materially lessened the work which we had hoped to accomplish. Several meetings were planned in different sections of the State, some of which we were unable to hold as we expected. In answer to calls from several places, speakers were sent out by the society to give instruction in spraying in accordance with the vote of the executive committee.

The president, with the assistance of Prof. Gowell, held a horticultural school at Northport, May 4. Lessons in spraying were given by Prof. Munson, and a paper on drainage and tillage by Prof. Gowell. The annual meeting and exhibition of the society was held at Norway, November 13 and 14. The collection of winter apples was the finest we have ever shown, the conditions of the past season having been especially favorable to the production of superior fruit. On one long table were exhibited one hundred and twenty plates of twelve specimens each, representing seven of our leading varieties of winter apples; large, uniform in size, highly colored and entirely free from any blemish, they made up an exhibit not soon to be forgotten by those who saw it, and one which, we believe, has never before been equalled in New England. A fine display of canned fruits and jellies, also of chrysanthemums and other cut flowers and ornamental plants added variety and attractiveness to the exhibition.

At their autumn meeting in Cleveland, O., the apple shippers of the country announced that there was a prospect of a crop not less than that of 1896. This statement was reported and enlarged upon by the newspapers until the orchardists were convinced that the country was overstocked with apples, and many sold at prices that barely paid the cost of picking and barreling.

The farmers who thus disposed of their apples lost heavily, and needlessly, and this calls our attention again to the importance and necessity of reliable crop reports.

While the crop was very large in some of the best fruit-growing sections of the country, the central southwest, which has become a large factor in apple production, had a small crop of inferior fruit. The destructive gale in September, and the prevalence of bitter rot also lessened the crop materially, and these conditions should have been taken into account by the producers of Maine. Our interest in this matter of wide-awake, up-to-date reports is sufficient to warrant considerable outlay for such information as would insure the marketing of our crops intelligently. It seems to us that the most hopeful source of such information lies in the various State horticultural societies. We would suggest that our society take the initiative in calling on them to form a national organization for this purpose. To this central station the different horticultural societies should report several times during the season the condition of the orchards, the ravages of insects and of fungus diseases and the prospective amount and quality of the fruit. The results of these reports, distributed among the members, would furnish them information secured for their benefit and much more valuable and reliable than that supplied by the shippers.

The facilities for transportation and the system of marketing are improving every year, so there is not the danger of an overstocked market and consequent loss that threatened us even a few years ago.

Apple buyers from the West acknowledged that they came to Maine because the quality of our fruit could not be surpassed, and our apples have this year a reputation second to none. If we are awake to the importance of keeping and extending this reputation we will give our neglected orchards better care in dressing, tilling and pruning, as well as in spraying for the distruction of insects and fungus diseases. Though nature may not soon again be so lavish of her favors to us as she was this year, yet she will not fail to reward intelligent and persistent effort.

If to such thoroughness and care in cultivation as will insure superior fruit we will add care in handling and honesty in packing our apples we need not fear to place our fruit in competition with that grown anywhere in this country or in Europe.

Through the efforts of President W. M. Munson a few growers were induced to send apples to the Paris Exposition, and I am in receipt of the following letter in reference to the same.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF POMOLOGY,
WASHINGTON, D. C., June 8, 1900.

Mr. Charles S. Pope, Secretary Maine State Pomological Society, Manchester, Maine:

DEAR SIR:—Advices just received from the Paris Exposition through Mr. Wm. A. Taylor, Assistant Pomologist in charge of installation of the United States exhibits in Group VIII, Horticulture, announces that among the awards made by the second International Competitive Temporary Exhibit that the Maine State Pomological Society was awarded a second prize. Accept my hearty congratulations. Other competitive exhibits are to follow and you may hear from us again.

Very truly,

G. B. BRACKETT,

Pomologist.

OFFICERS FOR 1901.

President.

Z. A. GILBERT, North Greene.

Vice-Presidents.

D. P. TRUE, Leeds Center,
C. A. ARNOLD, Arnold.

Secretary.

D. H. KNOWLTON, Farmington.

Treasurer.

CHARLES S. POPE, Manchester.

Executive Committee.

The President and Secretary, *ex-officio;* John W. True, New Gloucester; R. H. Libbey, Newport; V. P. DeCoster, Buckfield.

Trustees.

Androscoggin county, John Briggs, Turner.
Aroostook county, Edward Tarr, Castle Hill.
Cumberland county, T. M. Merrill, West Gloucester.
Franklin county, F. D. Grover, Bean.
Hancock county, Mrs. S. L. Brimmer, Mariaville.
Kennebec county, E. A. Lapham, Pittston.
Knox county, Alonzo Butler, Union.
Lincoln county, H. J. A. Simmons, Waldoboro.
Oxford county, Lemuel Gurney, Hebron.
Penobscot county, C. A. Arnold, Arnold.
Piscataquis county, H. L. Leland, East Sangerville.
Sagadahoc county, A. P. Ring, Richmond Corner.
Somerset county, F. E. Nowell, Fairfield.
Waldo county, Fred Atwood, Winterport.
Washington county, J. F. Sprague, Charlotte.
York county, C. A. Hooper, Eliot.

Member Experiment Station Council.

CHARLES S. POPE, Manchester.

MEMBERS OF THE SOCIETY.

NOTE.—Any errors or changes of residence should be promptly reported to the Secretary. Members will also confer a favor by furnishing the Secretary with their full Christian names where initials only are given.

LIFE MEMBERS.

Andrews, A. Emery............ Gardiner
Andrews, Charles E............. Auburn
Arnold, C. A..... .... .Arnold
Atherton, Wm. P...............Hallowell
Atkins, Charles G.............Bucksport
Atwood, Fred..... ....Winterport
Averill, David C..................Temple
Bailey, W. G.......................Freeport
Bennoch, John E............. . ..Orono
Bickford, Lewis I.......Dixmont Center
Bisbee, George E.................Auburn
Blanchard, Mrs. E. E...........Lewiston
Boardman, Samuel L............Augusta
Briggs, John........................Turner
Burr, John.......................Freeport
Butler, Alonzo.......................Union
Chandler, Mrs. Lucy A..........Freeport
Chase, Henry M., 103 Federal St., Portland
Chase, Martin V. B............. Augusta
*Cole, Horatio G..........Boston, Mass.
Corbett, Herman..... ......Farmington
Crafts, Moses. ....Auburn
Crowell, John H.............Farmington
Cummings, Mrs. Anthony. ..... Auburn
Dana, Woodbury S...............Portland
Dawes, S. H.......... .... Harrison
DeRocher, Peter.......Bradentown, Fla
Dirwanger, Joseph A.......... Portland
Dunham, W. W...............North Paris
Dyer, Milton.............Cape Elizabeth
Emerson, Charles L........South Turner
Farnsworth, B. B................Portland
Frost, Oscar F.... ....Monmouth
Gardiner, Robert H........Boston, Mass.
George, C. H.........................Hebron
Gilbert, Z. A................North Greene
Goddard, Lewis C....... ....Woodfords
Grover, Franklin D........... ... .Bean
Gurney, Lemuel..................Hebron
Hackett, E. C....... ....West Gloucester
Hall, Mrs. H. A....................Brewer
Hanscom, John................ .... .Saco
Harris, N. W ... .Auburn
Harris, William M......... ......Auburn
Harvey, F. L...........................Orono
Hobbs, M. Curtis......West Farmington
Hoxie, James S..........North Fairfield
Hoyt, Mrs. Francis............ Winthrop
Jackson, F. A.....................Winthrop
Johnson, Isaac A ....Auburn
Keene, Charles S................ Turner
Knowlton, D. H.............Farmington
Lapham, E. A....................Pittston
Litchfield, J. H.......... ....Auburn
Lombard, Thurston M...........Auburn
Luce, Willis A..............South Union
McLaughlin, Henry..... ....Bangor
McManus, John..............Brunswick
Merrill, T. M............West Gloucester
Mitchell, Frederick H............Turner
Moody, Charles H................Turner
Moore, William G.... ....Monmouth
Moor, F. A. .. ..Waterville
Morton, J. A..........................Bethel
Page, F. W........................Augusta
Parsons, Howard G.......Turner Center
Perley, Chas. I................Cross Hill
Pope, Charles S..............Manchester
Prince, Edward M... West Farmington
Pulsifer, D. W.......................Poland
Purington, E. F........West Farmington
Richards, John T............... Gardiner
Ricker, A. S..........................Turner
Roak, George M....................Auburn
Robinson, Henry A.............Foxcroft
*Rolfe, Samuel..................Portland
Sanborn, Miss G. P............ Augusta
Sawyer, Andrew S.......Cape Elizabeth
Sawyer, George B.............Wiscasset
Simmons, H. J. A.............Waldoboro
Skillings, C. W........... North Auburn
Smith, Henry S...............Monmouth

*Deceased.

LIFE MEMBERS—CONCLUDED.

Snow, Mary S. ....Bangor
Starrett, L. F....................Warren
Stetson, Henry....................Auburn
*Stanley, Charles..............Winthrop
Stanley, O. E....................Winthrop
Stilphen, Asbury C.............Gardiner
Strout, S. F..............West Falmouth
Taylor, Miss L. L., (Lakeside) Belgrade
Thomas, William W., Jr.......Portland
Thomas, D. S..............North Auburn
Thurston, Edwin......West Farmington
Tilton, William S..........Boston, Mass
Townsend, Mrs. B. T............Freeport
True, Davis P................ Leeds Center
True, John W.............New Gloucester
Vickery, James....................Portland
Vickery, John.......................Auburn
Wade, Patrick.....................Portland
Walker, Charles S.....................Peru
Walker, Elmer V....................Oxford
Waterman, Willard H......East Auburn
Wheeler, Charles E.........Chesterville
Whitney, Edward K.............Harrison
*Woodman, George W.......... Portland
Yeaton, Samuel F.....West Farmington

ANNUAL MEMBERS, 1899.

Abbott, L. F.....................Lewiston
Cook, Elijah....................Vassalboro
Cook, Mrs. Sarah F...........Vassalboro
Cook, Miss Eva L.............Vassalboro
Davis, F............................ Newport
Deering, Mrs. R. A. ....Newport
Eastman, A. A......................Dexter
Folsom, C. A......................Palmyra
Grant, Mrs. Alice.................Newport
Leland, Will E......... East Sangerville
Libbey, R. H.........................Newport
Libbey, Mrs. Clara M.............Newport
Marsh, Mrs. J. B....................Newport
Munson, W. M.........................Orono
Nowell, F. E........................Fairfield
Phinney, C. S......................Standish
Pope, Mrs. M. E..............Manchester
Sturgis, C. G..........................Auburn
Tarr, E............................ Mapleton
Twitchell, G. M....................Augusta

ANNUAL MEMBERS, 1900.

E. W. Wooster....................Hancock
S. F. Sweetsir............New Gloucester
V. P. DeCoster.....................Buckfield
J. W. Ricker..................East Auburn
F. H. Rollins...........Farmington Falls
Mrs. W. S. Marsh..................Intervale
Mrs. A. S. Carsley........New Gloucester
Mrs. A. C. Chandler......New Gloucester
Mrs. A. L. Richards......New Gloucester
Z. McAllister......................... Lovell
Benj. Tucker.........................Norway
Mrs. E. F. Bryant...............Buckfield
J. W. Bradbury......................Norway
O. N. Cox.....................North Norway
Mrs. Frank G. Noble............. Norway
Mrs. O. B. Upton...................Norway
Mrs. J. A. Chadbourne...North Bridgton
Herbert M. Tucker...........South Paris
S. D. Edwards........................Oxford
Elmer V. Walker.....................Oxford
A. C. Day.......................South Turner
J. W. Dudley.....................Castle Hill
S. L. Merchant....................Winthrop
L. P. Toothaker........Simpsons Corner
E. Tarr...............................Mapleton

*Deceased.

TREASURER'S REPORT.

Charles S. Pope, Treasurer, in Account with Maine State Pomological Society for Year 1900.

RECEIPTS.

January	1, Cash from Treasurer of 1899	$432 79
	Farmington National Bank, interest on stock	10 00
February	15, State stipend	1,000 00
	19, Farmington Water Company, interest on stock	5 00
April	2, Gardiner National Bank, interest on stock	3 00
July	1, Farmington National Bank, interest on stock	10 00
August	4, Farmington Water Company, interest on stock	5 00
	4, Gardiner National Bank, interest on stock	3 00
November	6, Augusta Safe Deposit and Trust Co., interest on deposit	62 41
	Membership fees	26 00
	Total	1,557 20

EXPENDITURES.

Jan.	20, Mrs. E. True, for board of officers at New Gloucester	$4 50
	24, E. Wooster, expenses attending New Gloucester meeting	10 00
	24, A. H. Kirkland, lecture and expenses	25 10
	24, Chas. S. Pope, Treasurer, premiums awarded at New Gloucester	93 75
	24, Fred W. Lee, stenographer at Newport meeting	21 45
	24, G. H. Sturgis, reporting for New Gloucester meeting	8 65
	24, Anna Barrows, lecture and expenses, New Gloucester	27 00
March	5, Maine Farmer Publishing Co., printing premium lists, etc	12 73
April	12, Bertha O. True, services as clerk at New Gloucester	5 00
	12, J. W. True, expenses at Augusta and express on trunk	7 16
	12, W. M. Munson, expenses as member of Executive Committee	16 30
May	16, G. M. Gowell,, expenses attending Pomological Schools, Auburn, Hebron, Northport	8 30
	16, W. M. Munson expenses and lecture at Northport	27 30
	16, W. M. Munson, completing work of Secretary, 1899	50 00
	16, Maine Farmer Publishing Co., printing circulars, New Gloucester	1 50
	16, Augusta Safe Deposit Company, rent of box	5 00
July	20, Charles S. Pope, expenses to New Gloucester, postage on reports, etc	24 12
	25, Charles S. Pope, attending meeting at Topsham	6 45
Nov.	8, Augusta Safe Deposit Company, in favor of permanent fund	100 00
	15, Canadian Express Company, transportation of fruit and exhibition material	21 15
	21, R. H. Libbey, attending meeting at New Gloucester and Norway	27 70
	21, V. P. DeCoster, expenses as executive committee, Lewiston and Norway	4 53
	21, Mrs. V. P. DeCoster, expenses at New Gloucester and Norway	6 52
	21, J. A. Roberts, rent of Opera House at Norway	12 50

Nov.	21, H. W. Collingwood, expenses and services at Norway	$31 80
	21, J. A. Woodman, board of officers and speakers at Norway	30 39
Dec.	1, Charles S. Pope, clerk hire at Norway	8 00
	1, Premiums awarded at Norway meeting	285 00
	1, Z. A. Gilbert, expenses at Norway meeting	4 50
	31, Charles S. Pope, expenses as Secretary, express, etc.	30 13
	31, Maine Farmer Publishing Co., printing premium lists, circulars	20 15
	31, Smith & Reid, binding reports for 1900	36 13
	31, F. H. Rollins, expenses at Norway	5 85
	31, J. W. True, expenses as Executive Committee	2 65
	31, D. H. Knowlton, expenses attending Norway meeting	2 85
	31, Charles S. Pope, salary as Secretary	150 00
	31, Charles S. Pope, salary as Treasurer	25 00
	Cash in hands of Treasurer	398 04
	Total	1,557 20

I hereby certify that I have examined the foregoing accounts of the Treasurer of the Maine State Pomological Society for the year 1900 and find them correctly vouched. I also find there is the sum of three hundred ninety-eight and 4-100 dollars (398.04) in the treasury. Z. A. GILBERT, *Auditor.*

March 9, 1900.

Permanent Fund Account, 1900.

DR.

To stock First National Bank, Farmington	$400 00
Merchants National Bank, Gardiner	100 00
Farmington Water Company	100 00
Augusta Safe Deposit and Trust Company	790 00
	$1,390 00

CR.

By 139 life members	$1,390 00

PREMIUMS AWARDED

At the Annual Exhibition held at Norway, Nov. 13 and 14, 1900.

APPLES.

For best general exhibition of apples: S. H. Dawes, Harrison, first, $10.00; C. A. Arnold, Arnold, second, $6.00; C. S. Pope, Manchester, third, $4.00.

For best general exhibition of apples grown in Androscoggin county: A. C. Day, Turner, first, $6.00; D. P. True, Leeds Centre, second, $3.00.

For same in Aroostook county: J. W. Dudley, Castle Hill, first, $6.00.

For same in Cumberland county: S. H. Dawes, Harrison, first, $6.00; J. W. True, New Gloucester, second, $3.00.

For same in Franklin county: E. F. Purington, West Farmington, first, $6.00.

For same in Kennebec county: C. S. Pope, Manchester, first, $6.00; W. P. Atherton, Hallowell, second, $3.00.

For same in Oxford county: E. V. Walker, Oxford, first, $6.00; Lemuel Gurney, Hebron, second, $3.00.

For same in Penobscot county: C. A. Arnold, Arnold, first, $6.00; L. P. Toothaker, Simpson's Corner, second, $3.00.

For same in Somerset county: F. E. Nowell, North Fairfield, first, $6.00.

SINGLE PLATES.

Baldwins: J. W. True, New Gloucester, first, $3.00; O. N. Cox, North Norway, second, $2.00.

Ben Davis: E. A. Lapham, Pittston, first, $3.00; S. D. Edwards, Oxford, second, $2.00.

Gravenstein: C. S. Pope, Manchester, first, $3.00; S. H. Dawes, Harrison, second, $2.00.

Northern Spy: S. L. Merchant, Winthrop, first, $3.00; E. V. Walker, Oxford, second, $2.00.

R. I. Greening: V. P. DeCoster, Buckfield, first, $3.00; B. Tucker, Norway, second, $2.00.

Roxbury Russet: Lemuel Gurney, Hebron, first, $3.00; S. L. Merchant, Winthrop, second, $2.00.

Tompkins King: S. H. Dawes, Harrison, first, $3.00; J. B. Bradbury, Norway, second, $2.00.

Yellow Bellflower: V. P. DeCoster, Buckfield, first, $3.00; Z. McAllister, Lovell, second, $2.00.

Fallawater: J. B. Bradbury, Norway, first, $1.00; E. F. Purington, West Farmington, second, 50c.

Grimes' Golden: E. V. Walker, Oxford, first, $1.00; S. D. Edwards, Oxford, second, 50c.

Hubbardston Nonsuch: Z. McAllister, Lovell, first, $1.00; E. E. Witt, Norway, second, 50c.

Jewett's Fine Red: V. P. DeCoster, Buckfield, first, $1.00; J. W. True, New Gloucester, second, 50c.

Milding: D. P. True, Leeds Centre, first, $1.00.

McIntosh Red: J. B. Bradbury, Norway, first, $1.00; L. C. Waterman, Buckfield, second, 50c.

Mother: C. S. Pope, Manchester, first, $1.00; L. K. Litchfield, Winthrop, second, 50c.

Munson Sweet: E. F. Purington, first, $1.00; A. C. Day, second, 50c.

Peck's Pleasant: D. P. True, first, $1.00; J. W. True, second, 50c.

Pomme Royal: Chas. S. Pope, second, 50c.

Pound Sweet: J. W. True, first, $1.00; Mrs. B. T. Townsend, Freeport, second, 50c.

Rolfe: F. E. Nowell, first, $1.00; J. B. Bradbury, second, 50c.

Stark: D. P. True, first, $1.00; F. J. Sawyer, Otisfield Gore, second, 50c.

Starkey: D. P. True, first, $1.00; E. F. Purington, second, 50c.

Twenty Ounce: V. P. DeCoster, first, $1.00; S. H. Dawes, second, 50c.

Wagener: W. C. Whitman, South Turner, first, $1.00; J. W. True, second, 50c.

Wealthy: J. B. Bradbury, first, $1.00; A. C. Day, second, 50c.

Spitzenburgh: H. M. Tucker, South Paris, first, $1.00; B. Tucker, Norway, second, 50c.

Talman Sweet: C. S. Pope, first, $1.00; F. D. Grover, Bean, second, 50c.

Golden Russet: H. M. Tucker, first, $1.00.

Fameuse: V. P. DeCoster, gratuity, $1.00.

Deane: E. F. Purington, gratuity, $1.00.

Alexander: J. W. Dudley, first, $1.00.

PEARS.

General exhibition of pears: S. H. Dawes, first, $6.00; E. V. Walker, second, $4.00.

Buerre d'Anjou: S. H. Dawes, first, $1.00; J. W. True, second, 50c.

Buerre Bosc: S. H. Dawes, first, $1.00; E. V. Walker, second, 50c.

Buerre Clairgeau: S. H. Dawes, first, $1.00.

Duchesse d'Angouleme: S. H. Dawes, first, $1.00.

Goodale: S. H. Dawes, first, $1.00.

Howell: S. H. Dawes, first, $1.00; E. V. Walker, second, 50c.

Louise Bonne de Jersey: S. H. Dawes, first, $1.00; E. V. Walker, second, 50c.

Lawrence: Lemuel Gurney, first, $1.00; Benj. Tucker, second, 50c.

Sheldon: J. W. True, first, $1.00; S. H. Dawes, second, 50c.

Idaho, Garber, Duchesse de Bordeau: S. H. Dawes, gratuity, $1.00.

Vicar of Winkfield, Keiffer, Frederick Clapp: E. V. Walker, gratuity, $1.00.

Collection Quinces: S. H. Dawes, first, $1.00; D. P. True, second, 50c.

Collection Grapes: S. H. Dawes, gratuity, $2.00.

Plate Niagara Grapes: L. K. Litchfield, gratuity, $1.00.

Plate Concord Grapes: W. C. Symonds, Norway, gratuity, $1.00.

CANNED AND PRESERVED FRUITS, ETC.

Exhibition Canned Fruits, etc.: Mrs. L. K. Litchfield, first, $6.00; Mrs. O. B. Upton, Norway, second, $4.00; Mrs. J. A. Chadbourne, North Bridgton, third, $2.00.

Canned Blackberries: Mrs. L. K. Litchfield, first, $1.00; Mrs. R. H. Libbey, Newport, second, 50c.

Canned Blueberries: Mrs. F. H. Rollins, Chesterville, first, $1.00; F. P. Towne, Norway Lake, second, 50c.

Canned Cherries: Mrs. F. D. Grover, Bean, first, $1.00; Mrs. L. K. Litchfield, second, 50c.

Canned Gooseberries: Mrs. L. K. Litchfield, first, $1.00; Mrs. R. H. Libbey, second, 50c.

Canned Pears: Mrs. A. T. Crooker, Norway, first, $1.00; Mrs. F. D. Grover, second, 50c.

Canned Plums: Mrs. B. T. Townsend, Freeport, first, $1.00; Mrs. L. K. Litchfield, second, 50c.

Canned Raspberries: Mrs. F. G. Noble, Norway, first, $1.00; Mrs. R H. Libbey, second, 50c.

Canned Strawberries: Mrs. A. T. Crooker, first, $1.00.

Canned Tomatoes: Mrs. L. K. Litchfield, first, $1.00; Mrs. A. T. Crooker, second, 50c.

Preserved Apples: Mrs. L. K. Litchfield, first, $1.00.

Preserved Currants: Mrs. R. H. Libbey, first, $1.00; Mrs. L. K. Litchfield, second, 50c.

Preserved Cherries: Mrs. F. D. Grover, first, $1.00; Mrs. L. K. Litchfield, second, 50c.

Preserved Pears: Mrs. V. P. DeCoster, Buckfield, first, $1.00; Mrs. L. K. Litchfield, second, 50c.

Preserved Plums: Mrs. L. K. Litchfield, first, $1.00; Mrs. F. D. Grover, second, 50c.

Preserved Raspberries: Mrs. L. K. Litchfield, first, $1.00; Mrs. F. D Grover, second, 50c.

Preserved Strawberries: Mrs. V. P. DeCoster, first, $1.00; Mrs. J. A. Chadbourne, second, 50c.

Collection Apple Jellies: Mrs. L. K. Litchfield, first, $5.00; Mrs. F. G. Noble, second, $3.00; Mrs. E. F. Bryant, Buckfield, third, $2.00.

Tumbler Apple Jelly: Mrs. R. H. Libbey, first, $1.00; Mrs. L. K. Litchfield, second, 50c.

Crab Apple Jelly: Mrs. L. K. Litchfield, first, 50c.; Mrs. J. A. Chadbourne, second, 25c.

Currant Jelly: Mrs. E. F. Purington, Farmington, first, 50c.; Mrs. L. K. Litchfield, second, 25c.

Grape Jelly: Mrs. L. K. Litchfield, first, 50c.; Mrs. J. A. Chadbourne, second, 25c.

Cranberry Jelly: Mrs. L. K. Litchfield, first, 50c.

Maple Syrup: G. H. Davis, South Paris, first, $1.00; Mrs. A. T. Crooker, second, 50c.

Maple Sugar: Z. McAllister, Lovell, first, $1.00.

Tomato Catsup: Mrs. R. H. Libbey, first, $1.00; F. P. Towne, second, 50c.

Evaporated Apple: Chas. S. Pope, first, $2.00; Whittier & Rollins, Chesterville, second, $1.00.

Canned Apple: Whittier & Rollins, first, $1.00.

Cranberries: A. C. Greenleaf, Farmington, gratuity, $1.00.

Canned Corn, Canned Beans: Mrs. F. G. Noble, gratuity, $1.00.

Mustard Pickle: Mrs. V. P. DeCoster, gratuity, 50c.

Pickled Pears: Mrs. V. P. DeCoster, gratuity, 50c.

Piccalilli: Mrs. V. P. DeCoster, gratuity, 50c.

Canned Dandelions: Mrs. R. H. Libbey, gratuity, 50c.

Chow-chow: Mrs. R. H. Libbey, gratuity, 50c.

Mixed Pickle: Mrs. R. H. Libbey, gratuity, 50c.

Ripe Cucumber: Mrs. R. H. Libbey, gratuity, 50c.

Dish Baked Apples: Chas. S. Pope, gratuity, 50c.

Jar Cider Jelly: Mrs. Marion Noble, Norway, gratuity, 50c.

PLANTS AND FLOWERS.

Exhibition pot plants: A. D. Park, South Paris, first, $5.00.

Ferns: A. D. Park, first, $1.00.

Hibiscus: A. D. Park, second, 50c.

Chrysanthemum: Mrs. Thos. Witt, Norway, first, $1.00; A. D. Park, second, 50c.

Display of cut flowers: Mrs. Lucy A. Chandler, Freeport, first, $8.00.

Roses: John Burr, Freeport, first, $5.00.

Carnations: John Burr, first, $3.00.

Chrysanthemums: John Burr, first, $3.00; Miss G. P. Sanborn, Augusta, gratuity, $3.00.

Pandanus: A. D. Park, gratuity, $1.00.

Norfolk Spruce: A. D. Park, gratuity, $1.00.

Sanseveria: A. D. Park, gratuity, 50c.

Japonica: A. D. Park, gratuity, 50c.

Ivy Geranium: Mrs. Harvey Wood, North Norway, gratuity, $1.00.

REPORT OF EXECUTIVE COMMITTEE.

MEETING OF THE EXECUTIVE COMMITTEE AT NEW GLOUCESTER, JANUARY 18, 1900.

Chas. S. Pope was chosen Secretary pro tem.

W. M. Munson, President,

J. W. True and R. H. Libbey were present.

Voted, To appoint Chas. S. Pope as Secretary to fill the vacancy made by the death of Prof. Elijah Cook.

Adjourned.

MEETING OF THE EXECUTIVE COMMITTEE AT AUGUSTA, APRIL 12, 1900.

W. M. Munson, President,

Chas. S. Pope, Secretary-Treasurer,

J. W. True and R. H. Libbey were present.

Minutes of annual meeting at Newport read and approved.

On motion of Mr. True, *voted,* that we use as much of the interest money due the Society, as shall make good the amount of permanent fund lost by the scaling down of stock of Gardiner National Bank.

On motion of Mr. Libbey, *voted,* to hold a series of Pomological Schools this spring.

On motion of Mr. True, *voted,* to hold a joint meeting with the Board of Agriculture at Camden in June.

Voted, That any Grange wishing special instruction in spraying and orchard management can receive help by communicating with the Secretary.

On motion of Mr. Libbey, *voted,* that we hold one school at Belfast and another at North Jay.

The following orders were drawn on approved bills:

Bertha O. True	$5 00
J. W. True	7.16
W. M. Munson	16.30

Adjourned.

Meeting of the Executive Committee at Lewiston, September 6, 1900.

All the members were present.

Mr. V. P. DeCoster was appointed a member of the Executive Committee to fill the vacancy caused by the death of Mr. L. F. Abbott.

Voted, To refer the location of the annual meeting to the Secretary.

On motion of Mr. DeCoster, *voted,* to hold the meeting about the middle of November.

The premium list was revised.

Adjourned.

Business Meeting, Norway, November 14, 1900.

The following letter from Prof. W. M. Munson, who was unable to attend the meeting on account of illness, was read by the Secretary:

Members of the Maine Pomological Society:

It was with the keenest regret that I announced to your Secretary my inability to be present at this, the annual meeting of the society.

In lieu of a formal address I wish to congratulate the society on the substantial progress made during the past year, and would state that never before has the society been in better condition for advancing the interests of horticulture in our State.

Owing to the death of Secretary Cook, and the illness of other officers, the program as outlined at our last meeting has not been strictly carried out. Some pomological schools have been held and others are planned for, and will be held during the month of December.

In fostering the educational work, the encouragement of the "practical" in fruit and flower growing has not been forgotten. The winter meeting at New Gloucester was a pronounced success and this exhibition was second only to that shown at the annual meeting at Newport.

It had been my purpose at this time to outline a plan for encouraging the improvement of farm homes. We know that one of the most important factors in retaining the interest of young men and women in the farm is an attractive home environment, and it seems to me that one of the important objects of this society is to encourage such changes as will easily and effectively make the desired improvements. I would suggest that the matter be referred to the Executive Committee with power to act.

I congratulate the society upon the enterprise shown by certain of its members in providing fruit for the Exposition at Paris, and upon the prizes received. In this connection I would call attention to the Pan-American Exposition to be held in Buffalo, N. Y., next year, and would urge that steps be taken *at once* to have Maine properly represented at this Exposition.

In conclusion I wish to express my appreciation of the cordial co-operation on the part of my fellow officers and members of the society and bespeak for my successor the same support.

Fraternally yours,

W. M. MUNSON,

President.

After an extended discussion it was moved by Mr. Gilbert that the Secretary be instructed to secure contributions of fruit for the Pan-American Exposition at Buffalo.

Secretary's report read and approved.

Treasurer's report read and accepted.

The following committee of resolutions was appointed:

D. H. Knowlton,
J. W. True,
C. A. Arnold.

The following amendments to the constitution were presented: No one shall be eligible to office except life members; also, no one shall be entitled to vote in the society unless he has been a member for one year. The amendments were considered separately and after discussion, *voted,* that further consideration on both amendments be indefinitely postponed.

Proceeded to the election of officers and made choice of the following:

Z. A. Gilbert, North Greene, President.

D. P. True, Leeds Centre, 1st Vice President.

C. A. Arnold, Arnold, 2d Vice President.

D. H. Knowlton, Farmington, Secretary.

Chas. S. Pope, Manchester, Treasurer.

J. W. True, New Gloucester, R. H. Libbey, Newport, V. P. DeCoster, Buckfield, Executive Committee.

Chas. S. Pope, Manchester, was elected member of the Experiment Station Council.

Voted, To continue committee on binding reports.

On motion of Mr. Knowlton,

Voted, That the committee on binding transactions that have accumulated be requested to urge the State Librarian and those who may have the disposition of the State funds appropriated for binding purposes, to apply so much of said funds as may be necessary to bind these transactions.

That this society also urges that these volumes when bound may be used by the State Librarian in exchange for the transactions of horticultural societies in other states, that in this way there may be formed a horticultural department in our State Library.

On motion of Mr. Libbey it was *voted,* to choose an Auditor. Mr. G. M. Twitchell was chosen Auditor.

The following report of the Committee on Resolutions was read and accepted:

In behalf of the State Pomological Society and the numerous visitors who have attended this meeting, your Committee on Resolutions beg leave to present the following report:

Resolved, That in Prof. Elijah Cook we had an earnest friend of our fruit interests in Maine, that we recognize the great value of his services to the cause of horticulture in Maine, that we sincerely mourn his loss, and would hereby convey to his family and friends this expression of our appreciation of his services to the society, our grief at his death, and our sympathy in their sorrow.

Resolved, That in Lyman F. Abbott this society has had a warm friend from the time of its organization, that it was in recent years his great delight to do his utmost to promote its interests through the columns of his paper, and that to this we owe very much of the high standing our society has attained.

That we mourn his death, and recall his genial manners and cordial words, and it is with sorrow in our hearts that we convey to his family token of appreciation of his life and influence in our society.

Resolved, That we have missed at our meetings, our President, W. M. Munson, that we appreciate his earnest work in the past, his counsel and his research, which have always been at our command, and we take this occasion to extend to him our regrets for his misfortune, and united wishes for his early and permanent recovery.

Resolved, That we hereby extend our sincere thanks to the Grange and the citizens of Norway, for the cordial invitation and reception they have given us on this occasion.

Resolved, That our thanks are hereby given to the railroads for reduced rates, to the hotels for special terms and numerous courtesies.

Resolved, That our thanks are also extended to the local and State papers for the wide notice they have given this meeting, and excellent reports of its transactions they are giving to the public.

All of which is respectfully submitted.

D. H. KNOWLTON,
JOHN W. TRUE,
C. A. ARNOLD,
Committee on Resolutions.

THE ANNUAL MEETING.

Early in the season the society received an invitation to hold the annual exhibition and winter meeting at Norway. Not having held a meeting for some years in this section of the State, the Executive Committee decided to accept the invitation and accordingly notice was given and a program and premium list issued for a meeting, which we think proved to be one of the most profitable ever held by the society.

At the appointed hour, November 13, the meeting was called to order by Vice President D. P. True, and in behalf of the citizens of Norway and vicinity, Hon. J. A. Roberts gave the following

ADDRESS OF WELCOME.

Mr. President, Ladies and Gentlemen:

We are exceedingly glad to have the Maine State Pomological Society meet with the people of Oxford county. Our people know something of your purposes and your work. They believe in them, and they are willing to help the cause along.

I believe there is no part of the world where fruit of a higher order can be raised than right here with us. On this account the world is looking to us more and more for fruit. For a few years past caterpillars and other insect enemies of the apple, coupled with fungous diseases, have very much discouraged our apple raisers and this has resulted in neglected orchards. Many had almost come to the opinion that there would never be raised again in Maine such fine apples as had been grown in the past. This year's crop of fruit shows us how foolish were our opinions, how weak our faith in an overruling Providence, and how short-sighted we were to neglect our trees.

While in the last few years nature has seemed to conspire against us and aid and abet our enemies, we see her stepping in this year, brushing aside all obstacles in our way and giving us an old-time crop of fruit.

The lesson of these events is that we should never lose faith in our work, but should press forward, having faith that in time there will be sure to come a solution of our difficulties.

Now the production of fruit is not all there is to be considered. There is a business side to this matter. The people this year who have sold their fruit, given it away, almost, as it were, the prices being today almost twice what they were a month ago, are regretting their haste. And now while this Pomological Society has for its chief business, I presume, the encouragement of the growth of fruit and the solving of difficulties which stand in the way of fruit growers, I believe the time ought to come when that body or some other organization should create in the State of Maine a bureau of information and should be able to tell the farmers of this State the actual condition of the fruit market in this country and in other countries.

I believe this can be done without great expense, and if it can be done in no other way I believe it would be good policy for the State itself to establish such a bureau, and with the expenditure of a small sum of money I believe there could be brought to the farmers of this State many thousands of dollars annually. Last year the people of this section held on to their apples and lost because they did not have the information they ought to have had. This year the opposite is the case. They have sold early and lost on their crops.

I am glad to see so many here this afternoon. This is one of the largest and most important fruit sections of this State. I am glad to see the interest that is being taken in this industry. I think it would be a wise policy for us to take better care of what we have first, and then extend our operations.

Now I want to bid you all welcome here. We are glad to have you here. We expect to receive from this meeting a spirit of encouragement, something that will help us along over these difficulties, and that coming here will be remembered by all of us as productive of great good to us all. I am glad to see the people who have come in from neighboring towns. We will try and do all we can to make your stay comfortable, and trust you will gain from this meeting much of good and much of pleasure, and when tomorrow's sun declines to the western hills and this event has become a part of history, we will go away feeling glad that we came.

RESPONSE.

By Mr. KNOWLTON of Farmington.

I have listened with great pleasure to the cordial welcome extended by your representative on this occasion. It is a pleasure to me to respond to this welcome with a few words in behalf of the Pomological Society, and in behalf of the numerous visitors who have assembled here on this occasion.

As I have thought over this matter there came to my mind the meeting which the Pomological Society held in the town of Norway in the month of February, 1890. I remember very well the program which we presented on that occasion. I remember also the cordial invitation which was extended to us by the Grange, and the very pleasant meeting which we had. That year there were six counties represented in the fruit exhibition. The exhibit was not as large, it was not as beautiful as that which we find here today. At that meeting Dr. Hoskins and ex-President Stockbridge of the Massachusetts Agricultural College were present as representatives of the fruit interests outside of this State.

I remember the instruction which we received from both. Then another matter which was presented on that occasion was something of special interest to me and at the time a special pleasure. I refer to the address of Mrs. Beedy on "Education in Flowers." I know that many of you will recall that address with a great deal of pleasure and satisfaction. Then there was another address which I have always prided myself upon, as I was the secretary of the society at that time and had great difficulty in obtaining a speaker who should represent that important subject, that was the lecture of Dr. C. D. Smith on "The Dietetics of Fruit." And I am glad to say, that that was the best exposition of the subject given, up to that time.

Then again there was present Prof. F. L. Harvey, who spoke on the subject of "Insects." His address was an excellent one and was well received. It seems to me that there is no one whose death the fruit interest of the State deplores more than that of Prof. Harvey. He was a most diligent student and he gave us much information on the subject of insects. There was also represented at that meeting by Mr. True, a plan for a fruit growers' organization, the object being to bring the fruit growers of the State together along just such lines as our brother has mentioned here today that we may be instructed in growing and selling fruit, so that the man who grows the fruit may receive the best possible returns from it. This subject was brought before the fruit growers of the society at a later meeting of the society held in Bangor. I had the pleasure of presenting to the society and to the people of the State a paper which attracted considerable attention at the time, for I think it was published in full in several of the leading papers, recommending organization for the purpose of growing fruit, just as capitalists in other states put their money into organizations for this purpose. I urged it then, I still urge it, believing there is no point in fruit growing to-day that offers more in return for the labor and capital expended than here in the good old State of Maine. Then again at our Winthrop meeting which was held in 1896, when the State of Maine was well-nigh deluged with fruit and hardly knew what to do with it or how to get anything from it, an organization was recommended looking toward cold storage on some co-operative plan that the small growers might economically store their fruit until it could be marketed at a profit. It was a good idea and I believe in it still. There are numerous organizations in California and the South that are bringing to our doors all through the year, grapes, oranges and other fruit and placing them before us in an attractive form and even at a lower price than we can buy good apples even in the apple-growing State of Maine. On our fruit stands there are oranges in abundance and they are sold right side by side, when there happens to be apples there, and for less money. If they can get anything out of it over the cost of the labor and capital, it seems there is a chance even for the fruit growers of the State of Maine.

This idea of organization,—I like it. There is something about it that needs to be talked up and worked up until people get used to it. It is particularly manifest this year. Not many weeks ago an apple buyers association assembled not far away and they had a consultation. They planned a good many things and among these things it seems to me there was one that met with the favor of the association that was directly inimical to the fruit growers of the State of Maine. Soon after their association met there came from Europe and America reports that told us there was an immense crop of apples, and every buyer that came in would pull from his pocket statements prepared on purpose for your reading and you could read the same for yourselves. The result was a panic among Maine fruit growers and thousands of barrels of fruit have been sold for 75 cents and $1.00 per barrel and in some cases even less.

To-day we are here in a two-fold capacity. In the first place we come here to learn of you by the exhibition of these fruits and flowers and social intercourse with your growers. We expect to learn and enjoy much and I am very sure that we shall not be disappointed. Second: We come here for the purpose of helping you and other fruit growers of the State of Maine. We offer you an excellent program covering a wide range in fruit and flower interests. We are here to help you and I am sure that every speaker on the program will enjoy being questioned as to what he may say, and I beg you to be free with your questions. If there is anything in which we can serve the fruit interests of Oxford county it will be our delight to do it.

I thank you for your cordial words of welcome and for the interest taken in our society. We know we shall enjoy being here and we hope that our visit may be fruitful in doing you much good and in helping you to enjoy the fruits of the abundant harvest which this season has brought forth.

STRAWBERRIES FOR PROFIT.

H. W. COLLINGWOOD, New York.

I am going to tell you how they raise strawberries in New Jersey. In the first place we want a strawberry in New Jersey that is a great, big, firm berry. In our markets you will find the market fairly flooded with little berries, fairly well colored but too small. When the crop is rushing in from all parts of the country you wiil find that these little berries can hardly be given away, but when we send our great big, firm, solid berries they are sold before they get there. If a strawberry grower is going to spend his time, if he is going to buy fertilizer, if he is going to put labor on his land, the first principle of crop raising would be to raise these great, big, firm berries. You can do it. We do.

Our best berries are produced on heavy land. We think we can raise the largest, finest and firmest berries on our heaviest soil. I don't mean down in the swamp; the soil I mean would be a clay loam, containing a fair proportion of clay. The ground is dark in color, that gives us our best strawberries. I don't believe in growing the strawberry *plant* on the same kind of soil on which we try to grow the strawberry fruit. I mean this, if I could have my choice I would have my strawberry plant grown on the poorest soil on the farm, for there we get a larger and wider root growth. I would set these plants in heavy soil. To illustrate: If I wanted a boy or young man to come to the city of New York or some other large city to take hold of a great business and get the most out of it in a few years, I would go into the country among the hills and get a boy brought up among hard conditions. I should expect that when put into the city the health and strength from his country training would enable him to do extra work.

I have spent some time in digging up strawberry plants to examine their roots. I think it would do us more good if we would not be satisfied with studying that part of the plant that stands up from the ground. You will have to admit that the most important part of the plant is underneath the ground, for that is where it eats. Most people start out with the idea that the roots of the strawberry plant run out all over the ground.

I had an idea that the strawberry roots were almost as long as the roots of the raspberry, blackberry, corn, or potato. I have never yet been able to find the root of a strawberry plant that ran out three inches beyond the leaf surface. The roots go down into the ground but do not go out very far. Perhaps you never thought of that before. You may put the roots of the strawberry, as I might say, in a peck measure. Think of what the strawberry has to do. Take a Gregg raspberry plant, I have traced the roots of the raspberry plant six or eight feet in different directions. Here is a big strawberry plant growing inside of a peck measure and here a great raspberry plant growing in a space almost equal to the size of an ordinary room, yet they produce each about the same weight of fruit. All plants are not alike in feeding habits. I do not feed my cow the same as I do my horse. I do not feed dishwater to the cow, but I give it to the pig. I do not feed much corn fodder to the pig but give that to the cow. So we divide things up. The strawberry plant is a heavy feeder and we can feed it to the best advantage by understanding the needs and habits of that plant. Put it in another way. Here is a calf, and here is a baby, perhaps three or four months old, both feeding from the same cow. Now the calf will chase the cow all over the field, but in order to feed the baby you must milk the cow and put the milk into its mouth. It is the same in feeding plants. I would not broadcast manure or fertilizer for strawberries as we grow them. I believe like the baby the strawberry must have its food brought right up close to its mouth. You put fertilizer or manure anywhere in a ten-acre field and your corn, grape or potatoes will find it. It is not so with the strawberry plant. The food must be brought up close to it.

Now what shall we feed the strawberry on? I said first I preferred to have my plants started on a sandy soil. I want the largest root system I can get. We get this in an open, porous soil. Therefore I want my plants grown on light, sandy land. I want to grow my fruit on the heaviest land I can find on the farm. How do we feed the plant? In the first place we do not want to buy stable dressing for our strawberries. We prefer commercial fertilizer. I never knew a weed to be found in a commercial fertilizer. We have tried various mixtures and have settled down to this combination as the best: 400 pounds of nitrate of soda; 400 pounds of muriate of potash; 400 pounds of fine ground bone; 800 pounds of acid phosphate.

Most people will say that it is an expensive fertilizer to make. Our experience had been that a good grade of fertilizer put on the ground is never lost. A little of the nitrogen may be washed down and wasted but the minerals are always there ready for business.

During the days of slavery there was an old darkey who could not help stealing chickens, it was a part of his nature. He stole the chickens his master had fattened for his own use. His master came to him and said, "the next time you steal a chicken I shall bring you up before all the slaves of the plantation and have you thrashed." The fellow went as long as he could go but one night when coming home from church he went in and stole a chicken, and his wife cooked it and he ate it. He was brought up before the big house and stripped. There stood the overseer with the master who felt badly to think he was going to be whipped. "Can't we save you in some way? What did you do this thing for?" The darkey said, "You just look at this, Master, you owns this nigger and you owns this chicken. When I ate that chicken you didn't lose anything, you may have less chicken but you got more nigger." So when a man grows strawberries for gain and does not want to put on so much fertilizer, he must remember that while he may not have so much fertilizer he has more strawberries. It is not possible for potash and phosphoric acid to be lost out of the soil of a good strawberry bed.

On a small farm where every acre must count, strawberries may be started as follows: Plant potatoes in hills the first year. Potatoes in hills may be cultivated both ways and kept free from weeds even if hand pulling is needed. We can dig early potatoes in the latter part of July or early in August, after they are dug work up the ground with a plow or cutaway harrow and sow the southern cow pea in drills. When this is done and the cow peas are carefully cultivated we obtain a good crop of humus or vegetable matter and, if need be, at the last cultivation we can sow rye or crimson clover and thus secure a good full crop. When we sow rye or clover directly after potatoes we are troubled with the white grub and when we get a crop of white grubs into the ground we cannot raise these big fine strawberries.

The southern cow pea is the least likely to attract the white grub. Is it because the white grub does not like the cow pea? No, it is not. I thought we had got hold of something that the white grub would not touch, but I found that it was the late cultivation that destroyed the insect. Constant surface cultivation late in the season is the only thing I know of to cut down the white grub.

In this way we secure a heavy growth of cow pea vines. The next spring we plow them in. We either set our strawberry plants in the spring or keep the earth constantly stirred up until we get ready to set in June or set our runner plants in the latter part of July or about the middle of August. In the first case you can take your plants and put them in in little trenches putting the roots down—keeping them well watered until ready to set.

For setting strong runners we use what is called a Richards' transplanter. This is shaped like an ordinary tin can with the bottom and the top cut off (they are made of sheet iron), fasten a bail to it, and you have the transplanter. We go along and pick out the plant that we want; the strong ones. Then we take the transplanter and drive it right down, around that plant and press it down with the foot, then take hold of the bail and pull it up. You have a young, vigorous plant growing in the center of a large ball of dirt. We dig them in that way. A man goes along and digs out the most vigorous plants, puts them right on a wheelbarrow, hauls them right into the field and with another transplanter digs a hole just big enough for the plant with its bale to slip down into and there it is. It has not lost even a single instant of growth and will not even wilt.

I have transplanted in Northern New Jersey every month in the year. You can't do that up here. I spoke of having this land rich. We work it up and get it into beautiful shape. We take this fertilizer I speak of and apply all we dare, or say about twelve hundred pounds to the acre, putting it right in across the field in a narrow space where the plants are to go. We don't pretend to broadcast it all over the field. We would rather put it right where these roots are going. Then we take a cultivator and run it up and down several times and work that thoroughly into the ground. Then put a light roller on and pack it into the ground. Then we are ready to set out.

And how these plants grow. We set them in drills about three feet apart and about eighteen inches apart in the drills, and then we begin to cultivate them. And we cultivate them if we have to neglect every other crop on the place. Why? Because the strawberry is a plant that must have this petting and constant care. It has got to be petted; it has to have every want supplied. If we set them out we must take care of them and push them along. Along about the first of September I would give them another dose of six or seven hundred pounds of the same fertilizer. You may think I am extravagant in using one ton to an acre of strawberries but as I have said, "you may have less chicken but you will have more darkey." You cannot raise these great strawberries unless you feed the strawberry plant. You must put the food right exactly where that plant needs its food.

Mr. J. H. Hale of Connecticut says this: "Put on all you dare to, then tell the hired man to shut his eyes and put on more, and then tell your neighbor who wants to see you ruined to put on more."

Why don't I wait till spring and put my fertilizer on then? I will tell you why. I believe that the fruit buds of the strawberry plant are already made and started before the plant goes into winter quarters. Right now the fruit is already provided for. You can make the strawberry a little larger by applying nitrate of soda in the spring, but the fruit buds were made during the months of August, September and October. It is then that the fruit buds are developed, I believe the time to fertilize the strawberry is then, when the buds are being produced. Scientists tell us that with some fruits the bud is made and matured a whole year before it is developed, and you can change your fruit but a little, possibly in shape, possibly in color, by spring fertilizing. The time to put your fertilizer on is during the summer and fall. I would not use anything but possibly nitrate of soda in the spring. Never use potash or phosphoric acid at that time. Two or three hundred pounds of nitrate of soda used in the spring will give you more foliage and a little larger berry, but if you use too much it will ruin your fruit by making it soft and mushy. The time to fertilize the strawberry is when the plants are set out. If they look drooping and you are not exactly proud of them, put on a little more about the first week in September and let it go. If you are going to have good big strawberries you have got to go right down in your pocketbook and lose six, eight or nine months interest on your money. If you raise these great strawberries they will be sold before they are picked. By the use of the Richards' transplanter system it is not necessary to set early in the spring but it may be done after early potatoes and early sweet corn. I have dug up plants with the transplanter and set them out between rows of early sweet corn, then when the sweet corn is picked the plants are well started. Some of you have perhaps tried potted plants but I doubt if you have had much success with them. To plant as I have described is much better. You can get larger plants and better plants. We do not care to have our plants in the rows develop more than two runners each. Some people think that they ought to have twenty, but we would rather develop two or three very large ones. You will be surprised to see how quick the runners will take hold and grow. The result is that by September we have a row of individual plants right straight across the field. It is not a matted row but a row of single big plants side by side.

We never want these rows very wide, for you should be able to run your cultivator close up to the plant. Pay no attention if your hired man comes to tell you that he don't think you had better cultivate them any longer because you will hurt the roots, you can't do it, the roots don't get out where they will be hurt.

We plant a grape vine here and a raspberry there and a blackberry over there and four or five feet away on the other side of a stone wall you bury a dog or a dead cat or a bone or any other fertilizer and what will follow? You give it time and you will find that the roots almost instinctively have turned to the wall and gone right over to the dog or cat or bone. I have seen the roots of a grape vine simply eat creases in a bone! The roots of the plant have run in the soil to where the bone or cat are buried. That is not the way with the strawberry plant. It was never intended to be a long, wide reaching plant. It was designed to grow within a peck measure or a bushel basket. These things I believe must be fully understood in order to produce fine flavored firm strawberries.

Many strawberry growers secure good plants, and take good care of them but yet they do not raise these fine big berries. In most cases this is the reason, they don't use enough potash. Most of our fertilizers are weak in potash which seems to give firmness and color to the fruit.

We mulch our plants about the middle of December. There is nothing I have been able to find that is better than the southern cow pea vines for a cover. It protects the plant and does not smother it down. When spring comes you rake the mulch off and cultivate, cultivate, just as you do for corn or potatoes, and keep cultivating as that agrees with strawberries and it pays us to do it. Simply keep your cultivator running up and down and keep the upper part of the soil all loosened up.

To sum up. In the first place get your plants right. If possible get them grown on light soil, then transplant to the heaviest soil you can get. Use something to get that soil all filled through and through with vegetable matter. Remember that the strawberry crop is a money crop. It is a big crop. Put them in in continuous hills. Put them so that you can use the cultivator and then cultivate and cultivate and then cultivate again. Keep them eternally stirred up. Use all the fertilizer you can possibly afford. Don't go and show the fertilizer bill to your wife until you have got it into the ground and then don't forget to turn right around when you sell the crop and get your wife everything she has wanted for she deserves it more than you deserve a new reaper or a new mower or any other tool. Put your fertilizer on and cultivate, cultivate, cultivate. Put your fertilizer on in the fall and early summer.

DISCUSSION.

Ques. To get the best results you would make plant production a business distinct from fruit production?

Ans. Yes, I believe that is right. Fruit production and plant production are two entirely different things. One is the production of leaves and the other is the production of fruit. I think the two business are entirely distinct.

Ques. Could wood ashes be used in place of muriate of potash?

Ans. The ordinary muriate contains fifty per cent of potash. Wood ashes five per cent and also about 700 pounds of lime to the ton. The objection is in regard to the lime. Any quantity of strawberry plants have been spoiled by the excessive use of wood ashes. If the ground is sour you can't do better than use wood ashes. If you know that land is acid and sour use wood ashes, if it is alkaline never put wood ashes on.

Ques. How many berries do you get from an acre or an acre and a half?

Ans. I regret to say I have never made a correct estimate of an acre. In the first place we have a big family and during strawberry time we almost live on strawberries and make sales of four, five or six thousand quarts to an acre. I have heard people say they have raised eight, nine or ten thousand quarts to the acre, four thousand quarts would be about the average. I have produced a quart, or one and a half pounds from a single plant.

Ques. Explain about the transplanter. Will the soil always cling?

Ans. It will not always do so. Usually it will. We generally transplant immediately after a rain. I have gone along with a watering pot and watered the soil around the plant. It would not do on a large scale. If a farmer has got a back yard and wants to do something to make a little money he can water those plants and dig them up and transplant them, but it would not pay on a large scale. Perhaps it would not pay to buy this transplanter.

The top as well as the bottom of this transplanter is open and you put it right down over the plant, force it right down clear to the ground. Then you have a little plant standing up in the middle of this can. Take the bail in your hand and if the ground is moist enough the plant will stand right in the centre of a little bail of dirt. I use the transplanter made by F. Richards, Keeport, R. I. It does not cost much for the whole outfit of a dozen. One hundred would be all even a large grower would need on a large scale. He would put them down over a plant and stamp on them then a man would follow behind with a wheelbarrow and pull it up and put it on the wheelbarrow and push it out. It is better than potted plants. With the little instrument I speak of there is no danger of their ever getting pot bound.

QUALITY AS A FACTOR IN COMMERCIAL FRUIT GROWING.

By Z. A. GILBERT, Agricultural Editor of the Maine Farmer.

The people like fruit. This desire of the appetite is universal. There has been a great increase in the consumption of fruit of the different varieties in the last few years. Take the strawberry as an illustration. Where but a few years ago this delicious fruit was available for only a few days in early midsummer, now from May to the close of its season in July the demand is only limited by the supply and the facilities for distributing the fruit among the people who desire it. The banana trade is further illustration in this same direction. Steamers are now engaged in the exclusive employment of the transportation of this tropical fruit from Central American ports to New York and Boston, and car loads are now called for in our nearby cities, where but a few years ago a few crates by express filled the full demands of the trade.

This great increase in the fruit demand among the people is due to the fact that people love fruit. It only has to be placed within their reach in order to be taken and consumed in these rapidly increasing quantities. And the end is not yet. No one is so short-sighted as to suppose that the limit of demand for fruit has yet been reached. As the taste for fruit is gratified the desire is intensified and gradually reaches a point where it becomes constant. Hence, when one kind of fruit no longer appears another is called for, and the round of the year is covered.

QUALITY.

The desire with every one is for good fruit. The better, of its kind, it is, the more it is desired and the greater the quantity called for. This takes me directly to the subject assigned me at this time.

Quality in its application to fruit is a sort of compound term. That is, there are several different properties characterizing fruit that in common parlance are combined in its quality. Even the Ben Davis apple has one desirable property that is included in the characteristic quality of the fruit—it is a good keeper. So, too, it is handsome, or good looking. While it is a good keeper and good looking, yet when you come to flavor it is the opposite of "good,"—it is inferior. Yet these properties combined make up the quality of the apple.

I use the term quality in a sense restricted to that which makes it good, delicious, acceptable to the taste, or on the other extreme, poor or undesirable. In the sense I use the term here an apple of high quality is a good one—delicious, inviting to the taste, acceptable to the senses. It is the property that enabled me years ago to sell to a fruit stand thirty bushels of apples in one season from a single tree for forty-five dollars. Tarrying in a fruit store a few minutes, the other day, to gossip over election prospects, the proprietor took up an apple, and biting out a piece, "I declare," said he, "that is a good apple; won't you have some apples, gentlemen?" as he passed around the box. It was the quality of that fruit that reduced the quantity in the box by a considerable number.

WHERE ARE WE AT?

The English market is the outlet for the surplus fruit of this state, and in fact of all the country east of the Mississippi. As a result, fruit specialists, fruit growers and fruit planters are largely confining their interest to a consideration of the demands of the foreign market. In the fruit journals and at fruit conventions we hear or read little but discussion of the foreign market and how to reach it with greatest success. For the last ten years and more scarce a member of our society, or any other planter of orchards in the State, as he held the tree in position and covered its roots in the willing soil, has thought of any other disposition of the fruits of the labor he was performing than the European market. Throughout the breadth of the apple producing belt of our country, clear across and beyond the Mississippi river, extensive orchards are being planted with the view to growing fruit for shipment abroad.

The standard of quality now being sought among us in a shipping apple, is a red color, and the ability to stand the shipping voyage. No other property seems to be considered desirable in a shipping apple. The Ben Davis stands the shipping voyage across the water as well or better than any other variety grown on an extensive scale among us. It also carries the other important requisite of red color. Hence the plantings of late years here in our State have been largely, where not chiefly, of Ben Davis trees.

Furthermore, forty to fifty years ago the great states of the interior of our country, in their earlier filling up with population, had not a single variety of apples that would withstand their winters. Within my remembrance, a single winter of unusual severity destroyed substantially all of the fruit trees throughout the prairie states. The demand was at once aroused for hardier varieties. Our government sent to Russia for hardy varieties which were successfully grown in that high northern latitude. Professor Budd, an enthusiastic horticulturist of Iowa, went abroad to the same country to study up the fruit growing of that hyperborean climate, and brought with him on his return scions of the many Russian varieties of which we have heard and read so much in these later years. Enthusiastic experimenters set about the work of originating new varieties that might prove hardy enough to stand the winters of the northwest. Great expectations were raised among fruit specialists all over the country. I recall the remark of that cool and candid observer and experimenter, the late S. L. Goodale, to the effect that he looked for vast strides of improvement in the fruit producing industry from the efforts going on to originate and search out hardier varieties of fruit.

As a result of this "iron-clad" craze that thus swept the country many new varieties have been propagated, recommended and sold all over the country that have little other merit than hardiness. The power to withstand a severe climate is a great merit, but does not give us a good apple. This search for hardy varieties was a necessity to the west. We did not need them, for we already had varieties that would stand our conditions and give us an abundance of fruit. But the demand for hardier varieties to meet the want of the fruitless west settled down into this "iron-clad" craze, and spread throughout the country. Little else was needed to sell trees than to label them "iron-clad." This has given us a class of apples, that while they can be produced in quantity, are inferior in quality. Such are the Ben Davis, and the Pewaukee, Haas, Fallawater, Mann, Gano, and a host of others that might be named. Not one among them all is a variety of high quality as I use the term in this paper, and as it is understood among fruit judges.

This demand for apples that will stand up in shipping, and this scramble for hardy varieties passed along to us from the necessities of the interior states have had the effect to rivet attention on these new kinds having no other characteristics of merit than those for which their originators were searching. The late planting of trees, even here as well as in those sections of the country where they can do no better, has been chiefly of these sorts so manifestly inferior in quality. To such extent have planters and propagators been absorbed in this one idea that they have hardly thought of the quality of the fruit they were preparing to grow. And not only this, but they have allowed varieties of high merit to fall out of attention for no other reason than that they were old.

HIGH QUALITY WANTED.

This effort to produce shipping fruit, together with the uncalled for chase after hardy varieties, is having the effect to fill the country up with inferior apples. We claim this is all wrong, and also that it is damaging to the fruit industry. Fruit growers are losing sight of the home market. While an outlet is needed for such of surplus fruit as there may be, yet the home market is far the more important, and never should be lost sight of. The tendency, so general in late years, to plant only these varieties inferior in quality has the effect to destroy demand rather than increase it. A purchaser desiring some apples for home use buys a barrel of the showy Ben Davis. The cook finds them inferior for her department, the family cannot eat them—that one barrel trails along all winter. The result is not only that few such apples are purchased, but what is worse, the desire for apples and the appreciation of them in the family is destroyed. While our population is increasing, and while the ability to gratify all desires of the appetite is on the increase among the non-producing people, the present course in apple growing serves to destroy the demand, thus created. Place a barrel of fragrant Gravensteins or delicious Bellflowers in place of those Ben Davis and several barrels will be called for, and an appreciation of fruit so cultivated that the demand will be constant so long as a supply is within reach. It is a law of demand that the higher the quality the more will be the consumption and the greater of course the demand.

This demand for high quality and its effect on the consumption of fruit when gratified is a matter that has been too much neglected by fruit growers and too much overlooked by conventions. The Gravenstein comes as near an ideal apple in quality probably as any kind we are growing. In this year of bounty it has been selling in Boston market for $2.50 and upwards a barrel, and at no time enough of them on the market. No year is there enough of them to be had to meet the demands of the consumers. Every year schooner cargoes of them are shipped from Nova Scotia to our Portland and Boston markets. It is quality that makes the demand for this variety.

What was it years ago that built up the demand in Portland market for the old Garden Royal? a variety so long neglected as to be almost forgotten even by our gray-haired veterans and which among the later growers in their scramble after fruit for the shipping trade is entirely unknown. It was this same high quality.

The Nodhead is another illustration in the same line. No one ever heard of any surplus of these deliciously rich and melting apples which had to be shipped abroad to get clear of them. Their quality makes a market here for all that are grown, and always at a price above the common grades of fruit. Yet, since the later planters have been running after shipping varieties selling for less money, little is heard of propagating this always salable variety.

The case, I presume, was never known of a purchaser wishing to exchange his barrel of that excellent old Yellow Bellflower for any one of the later varieties so largely planted. Its quality always satisfies the consumer, whether for eating or cooking.

The Rhode Island Greening is a variety always wanted for home consumption. Its rich quality gives it a welcome in every family.

The late David Briggs of Turner, whom we all remember as a warm friend of the work this society is laboring to foster, grew a variety of russet apples, small in size, not attractive in appearance, but which ripened up in mid-winter into an exceedingly rich and delicious fruit, and he stated to me, when I was studying up the russet apples a few years ago, that however plenty apples might be he never found any trouble in disposing of that kind. All that was necessary was to offer them anywhere known.

The little insignificant looking Pomme Grise is a russet apple that has been widely disseminated, though not extensively planted, yet has no other merit than its extremely high quality.

This home market needs to be cultivated. It is to-day the best hold on the business of fruit growing. Fruits suited to the demands of this consumption among our own people—juicy, crisp, melting, rich, luscious and fragrant, always command a price much above the ordinary barreling fruit grown for the foreign market, and which nobody here wants for any purpose so long as that of high quality is within reach. Unless this chase after hardy kinds, and varieties whose only merit is to stand up well on the shipping voyage, is stayed, we shall soon find ourselves in the condition where we have no apples suited to the wants of the critical home trade, and as a result, little home demand calling for apples.

As wealth increases among the people a demand for the very best of everything that can be produced keeps even pace with that growth. These higher levels in fruit supply are never filled and never will be. In the line of apple production the trend of effort is not in that direction. With the Annapolis valley, Ontario, New England, New York, and the whole belt of fruit producing country clear to the Rocky Mountain slopes planting trees and growing fruit for the foreign market, I here claim that the best outlook ahead is with him who intelligently caters to the home trade, basing his efforts on the business merits of quality.

QUALITY A FACTOR IN FOREIGN TRADE.

Throughout my entire experience with fruit and the fruit markets I have noted that finally the appreciation of any variety of fruit, and its resulting demand, settles down and finally rests on its quality. One would infer from the apples we are shipping abroad, and those kinds being planted for the foreign market, that the Europeans do not like good apples. I believe if growers and handlers of apples would study that market more closely they would find the evidence that, there as well as at home, quality, when they can find it, is appreciated, and that dealers there are ready to pay a premium on it. In the last issue of the London "Gardeners Magazine" reference is made to the recent great show of native grown fruits held in that city. There were 2,069 dishes of apples in the show, made up of 299 different varieties. The leading variety in this grand show was Cox's Orange, shown by eighty-five different growers. "This apple," that horticultural journal continues, "is pre-eminently the finest flavored winter apple grown in the United Kingdom and is becoming more and more popular. It realizes top prices in the market, and around the holiday season reaches to fancy figures."

A few days ago I clipped the following report of the Liverpool market, issued by Otto G. Mayer & Co., New York:

"We have just received a cablegram from J. C. Houghton & Co., Liverpool, which reports that the apples ex-Majestic have been sold to-day. They say that there is a general improvement in the condition of the apples, and that the demand has become active, and prices are advancing. They quote: Baldwins, $2.45 to $3.75; Kings, $4.60 to $5.55; Albemarle Pippins, $5.30 to $7."

This Albemarle Pippin is none other than the Green Newtown Pippin, usually found on our tables at the annual exhibitions of this society, grown in its highest perfection on the foot hill slopes of the Alleghany Mountains down in Virginia and Pennsylvania, where it is known by the name quoted above. All of us who have been shipping apples abroad, or have watched the reports of sales in those markets, have had longing eyes on the extremely high figures quoted for Newtown Pippins.

This Newtown Pippin is not of the popular color, is not specially attractive in looks, but in addition to being a good shipper, after it arrives at the market it is appreciated as the best apple in that market. It is its high quality alone that gives it the premium value in those markets.

The King always sells for a superior price in all shipments. Why does this apple sell better than the Twenty Ounce or Alexander? It is because of its superior quality.

Thus it appears that the people abroad know a good apple when they find it, and are ready to pay a superior price for fruit of recognized quality. Yet we are feeding them on Haas, Gano, and Ben Davis! As the business is now tending we shall soon have but little for them that is better.

Thus by a close study of the situation, abroad the same as at home, quality asserts its commercial importance in terms that growers should no longer overlook. It is everywhere the great controlling factor of value in the business of fruit growing.

EVAPORATING FRUIT FROM A COMMERCIAL STANDPOINT.

A very important question comes to the mind of every orchardist when he harvests his fruit, how and in what form shall I market the product? In years of plenty such as we experienced four years ago, and which earlier in the present season we thought would be repeated, the market becomes glutted with a large stock which rapidly deteriorates in quality and consequently in selling value.

When this condition is reached there can be but one result, low prices and unsatisfactory returns to the producer. Another thing that might cause a depressed condition of the market is that one-third or one-half of all the apples are inferior in quality. When the consumer buys a barrel of good fruit, pleasing to the eye as well as the taste, it is soon gone and another barrel is wanted. On the other hand the second quality is not so pleasing, there is not so much temptation to use it and as it begins to decay the family will care for no more apples. This leads us to consider if a better way cannot be found to market the second quality fruit at a profit.

I believe that this principle should be impressed upon the mind of every fruit grower in Maine, never to place upon the city market any second quality product of the orchard. These second quality apples should be either evaporated or canned. Canning has one advantage over evaporating to the farmer who is not very extensively engaged in the production of fruit. It costs but a comparatively small sum of money to provide permanent fixtures for canning. Exclusive of a suitable building, fifty dollars would furnish everything necessary for the work.

In comparing the relative merits of the two methods we find that the evaporating process makes a great reduction in weight and a corresponding reduction in transportation charges. A barrel of apples after being put in cans weighs the same as it did before, but in the evaporating process it is reduced from one hundred and fifty to twenty pounds, a little more than one-eighth of its original weight. Or in other words when your team goes to the station loaded with two tons of evaporated apple it is hauling an equivalent of one hundred and ten barrels of apples in their natural state. Again, when a barrel of apples is put into cans the cost of the cans is equal to the value of the apples so that the consumers must pay twice as much for the same quantity of apples canned as they would if evaporated.

The outlook for the home and foreign demand for evaporated apple in the immediate future is very encouraging.

The preliminary report of the director of the census bureau indicates that there has been an increase of 20% in the population of the U. S. in the last decade giving a total of more than 76,000,000 people. The increase in population is entirely in the cities and large towns, for it is evident that the population in the rural sections of our country has decreased rather than increased in the last decade. This makes it evident that the consuming population is increasing faster than the production of this class of goods. Another encouraging feature for the ready sale of evaporated apple is the great increase in the number of people who come to our State to pass the summer months. This is a wealthy class of people as a rule, who demand and are willing to pay for the very best products of the farms, and there is already a large and increasing demand for fancy evaporated apple from the hotel people who supply their wants.

While the foreign demand for our fancy evaporated apple has not kept pace with some other lines of production in this country, it is quietly and surely becoming an important item in the export trade; and when we consider that no special effort has been made to introduce or push the sale of these goods in foreign countries, the business that has been done is very satisfactory and indicates that in the near future, when its good quality concentrated in bulk and weight and adaptability for carrying long distances without regard to climatic conditions will make it a favorite article of commerce.

What needs to be done now is for our Agricultural Department at Washington to bring our evaporated fruit to the attention of the people in foreign countries, that its good qualities may be better known, and its own merit will do the rest.

Another reason why either canning or evaporating the second quality apples should be encouraged is, that they may become a blessing rather than a curse to our own people. If they are not put to some better purpose in the economy of the farm, they are likely to be made into cider, which is the beginning of so much intemperance.

It is now but a little more than twenty years since evaporated apple was first seen in our markets, and rather less than that time since it came into general use and was found as a regular article of merchandise in all the grocery and provision stores. Previous to that time the markets were supplied by "dried apple" which had been cut in quarters and placed on strings, then festooned on the sunny side of the wood-shed to dry. The sunny side was usually the side facing the road also, and the apple was sure to catch the clouds of dust wafted thither by the strong September and October winds, and here swarms of flies basked happily in the sunshine.

This apple was finally made into pies which furnished inspiration for poems like the one from which I quote the following lines and which some of you probably remember:

"How I abhor, detest, despise,
Abominate, dried apple pies."

But some bright genius conceived the idea that all this might be changed, that apples could be preserved clean, bright, wholesome, and pleasing to the taste, thereby adding one more article to the culinary department of the household.

The best quality of this evaporated product is a really tempting and wholesome article of food and has several points of superiority over canned apple. It is far better in flavor and substance for apple or mince pies, makes nice boiled cider sauce and properly prepared makes the nicest kind of fruit for cake.

In the last few years a very large business has grown up in supplying not only this country but the whole world with our evaporated apple, peaches, pears and other fruit products and potatoes.

Perhaps a short review of the different methods employed in evaporating fruit would be interesting at this time.

The first evaporators were square structures reaching from the first floor of the building to nearly the top of the second story with a wood or coal furnace in the basement, using hot air as it radiates from the very highly heated surface of the furnace to evaporate the moisture from the newly cut apple or other fruit and carry it to the top of the building where it was discharged laden with its burden.

The newly cut apple was first placed over the furnace or in the lowest part of the evaporating flue, and as it became heated it was gradually raised and other trays of fruit put in its place until that first put in arrived at the top of the flue.

This process was theoretically perfect, but in practice the currents of hot air were not evenly distributed, with the result that while some of the apple was dried too much, other parts of the same trays would be dried little if any.

Others tried the inclined flue, giving a chance for the air after becoming charged with moisture to pass off without going through the trays of nearly dry fruit.

This evaporator, it was claimed, could be managed with greater economy than the others; but soon gave place to the steam evaporator where the trays of prepared fruit are placed between pipes heated by steam, giving the operator perfect control over the amount of heat to be used, distributing the hot air evenly throughout the whole lot; with the result that the apple is dried evenly, thoroughly and with perfect cleanliness, which is so characteristic of the best evaporated apple found in the markets to-day. We believe this process to be the best yet devised for the purpose.

An ideal plant for evaporating apple where the capacity would be forty to fifty bushels per day would be a building about thirty by thirty-six feet, with either a basement or an adjoining room for the steam boiler, which should be enough lower than the floor in the main room so that when the boiler is set, the water which condenses very rapidly in the steam pipes may flow readily and rapidly back into the boiler.

There should be one thousand feet of pipe placed in branch T's with perhaps five pipes in the lowest bank or tier and four in each one above, placing these tiers of pipes one above the other and about one foot apart as high as is desirable. The pipes should be cased up in front with doors ten inches wide and about eight feet long, to give access to the space between the pipes for the apple. After the apple has been placed in the evaporator it does not need any attention until dry.

The so-called bleaching of the apple is an important part of the process. In reality they are not bleached at all, for when once discolored by action of the atmosphere no amount of bleaching will make them white again.

In the early days of evaporating apple, a small quantity of sulphur was placed on the hot surface of the furnace at intervals of about ten minutes, and the fumes would be carried by the currents of hot air through the whole mass of apple above to the top of the flue and thence to the open air. The apple was subjected to the sulphur fumes for four or five hours or until dry. When the apple became partially dry and in the very long time it was subjected to the sulphur fumes, there was liable to be a very fine deposit of the sulphur on the apple; enough so that a person with a fine taste could detect it. But the more modern method is to have a separate bleacher where six trays of the cut fruit may be placed and subjected to sulphur fumes for two minutes, which will prevent any discoloration of the fruit while in the process of drying.

It should be remembered that attractiveness of package is as necessary and important for apple as other things, and while the fifty-pound boxes neatly faced with overlapping slices does very well, apple put in one-pound packages in square pasteboard cartons is still more attractive and pleasing to most buyers, and is the best way to put it on the market.

The theory of evaporating the moisture from fruit (and practical work proves the theory to be correct) is to place the newly cut fruit (after being subjected to the bleaching process for two or three minutes) into a current of very hot air which soon forms a very thin artificial skin or covering to the apple, thus hermetically sealing the broken fruit cells containing fruit sugar and that intangible something which we call flavor.

The moisture in the apple is turned to vapor by the heat and forced out where it mingles with the air and escapes. The resulting product has all the good qualities of the original apples, for nothing has been added and nothing has been taken away except the moisture, and if the original fruit was good then the product will be good; but if the apples were crabbed and bitter or had any unpleasant flavor, then the product will be of the same character.

This evaporated apple is as different from the dried apple that was formerly used, as the handsome, delicious apples like the ones which so richly adorn this hall are from the small, inferior natural fruit, the dried apple was made from.

When the apple is evaporated and packed in the most attractive form, the marketing should receive the most careful attention, for on this depends to a great extent the success or failure of the enterprise. Generally the nearby markets are the best when we take into consideration the great expense involved in transportation for long distances, with the added expenses of commissions, storage, cartage and insurance which are so inseparably connected.

PRESERVING AND CANNING FRUIT.

By Mrs. R. H. Libbey, Newport.

When I was called upon to write a paper upon this subject, to be both practical and useful, I found it somewhat difficult to prepare a paper of the kind for this reason, there are so many different methods in canning and preserving, and it is presumed that every good housewife thinks her's the better way, but notwithstanding this, there are certain rules to be observed to get satisfactory results. God, in his overflowing goodness, has bestowed upon us numerous blessings, not the least of which are the beautiful flowers and our delicious summer fruits. These are especially adapted to the season in which they come, and to our needs at that time. The law of adaptation is seen everywhere. Note the fur of the seal and polar bear, with walrus fat for the needs of the Esquimaux, the citric fruits with their delicious acids for the people of the sunny South, and the beautiful, luscious summer fruits for us of the temperate regions, all good in their time and place. The great development of small fruit culture has taken place almost wholly during the recollection of many of us present, some of whom will remember when the delicious cultivated strawberry in the old home garden was little known, while the same in the village market was an unheard-of thing. Now the long trains go rattling along the great railways bearing hundreds of tons of delicious fruit to the great city markets, not now as a mere matter of luxury, but a necessary table supply. The excellent effect of fresh, wholesome summer fruit is admitted by all, and is therefore an important factor in the health problem. Those who, by words of encouragement, speak of farming as a noble occupation and encourage the young men with whom they come in contact to engage in this branch of industry and especially the cultivation of fruits, do a noble deed.

As we look around this spacious hall, beholding these beautiful flowers and delicious fruit, let us not forget that behind all is the lesson never to be forgotten, that here is our daily sustenance, and while it comes to us in response to labor, no one can tell the method of its coming. Wonderful are the mysteries hidden in these flowers and fruit, to be unfolded only by diligent search and patient investigation.

This is the work of our country life, the purpose of these meetings, the mission of the Pomological Society. Compass as we may the marvelous in all other departments, here we are awed by the great majesty of the thought embodied in the fruit and flowers. Into this field of investigation we are invited, to this line of duty we are to devote ourselves, for here are compensations, rich, enduring, satisfactory. No life in city or town offers like attractions; no opportunity for such rich returns out of patient investigation. Whatever tends to quicken love for these, to excite admiration for natural things, to stimulate desire to know a little more of why and how in these studies, will surely develop love and desire for country life. I like to see in every young man a laudable ambition to have a home and family of his own, with comforts and luxuries of his own production, and not the least of these is the choice and abundant supply of small fruits to grace his table all the year round, and here comes in the preserving and canning process which to me forms the most attractive and satisfactory part of housework. Since the glass jars, with air-tight covers, have been introduced, the old-fashioned preserves are seldom seen. Generally speaking, "preserving" means the cooking of fruits in an equal weight of sugar, long enough for the fruit to keep without being air-tight, while canning may be done with little or no sugar, and with just enough cooking to thoroughly heat the fruit, but the air must be excluded. The preparation of the fruit for these two forms is similar, and the same general directions will apply to each process. First to be considered is the condition of the fruit, which should be firm and sound, but not over-ripe. Among the best utensils to be used are the granite, porcelain or agate. I prefer the porcelain, notwithstanding it is heavier to handle. You can expedite the business if you are in a hurry, and most housekeepers are, by removing the lid from the stove, putting the kettle directly over the fire, thus hastening the process of heating, then removing it to the back of the stove you get a much steadier heat and the fruit is less likely to scorch or to boil over, hence does not require as much care during the process of preserving.

The time is in the past when a few jars of preserves, carefully stowed away in the cellar, brought forth only when visitors came, or dealt out very sparingly to tempt the appetite of the invalid, are sufficient. Every up-to-date housekeeper of to-day must be skilled in the art of canning, preserving and jelly-making, and will see that she has a good supply of these dainties, not only for company, but for family use, and enough to last the year round. I begin my preparations for winter when the dandelions come in early spring, salting down about thirty bushels last spring, packing firmly a layer of dandelions, then a layer of salt. This may seem to be a large amount, but not so when the shrinking takes place.

Next to the dandelions comes the rhubarb, which I put up in cold water, cutting in pieces as for pies without paring; there is a delicacy of flavor and color in the paring of rhubarb. Pack closely in jars, place in a pail, put in water until jars and pail are full. Seal with the jars under water. The next in order is the strawberry, which is said to be the queen of all berries. While this may be true in its natural state, there are other berries which retain their flavors much better when preserved or canned. I make it a point to prolong the strawberry season several weeks by crushing the berries, adding sugar and sealing them in jars. While we do not have the form of the berry, we can have crushed strawberry, retaining its delicious flavor and ever ready for the much appreciated shortcake.

The gooseberry with us ranks high with other berries and occupies a large space on our preserving table. We consider the Industry and Downing the best. Gooseberries are much better cooked in the jars. It requires a little more work, but you will be repaid for the extra trouble in the results obtained. While the berries are cooking, prepare a heavy syrup, fill the jars full and overflowing, put on good, new rubbers, seal tightly and you will have not only good preserves for the tea table, but an excellent relish to be served with meats. Use the same method in canning the raspberry as the gooseberry. When cooked in the jars you retain the form, color and flavor; the syrup does not require to be as heavy for the raspberry as the gooseberry, and the berries need only to be thoroughly heated and sealed air-tight.

I usually use the cold process for preserving currants, using equal parts of currants and sugar. Great care must be used in preserving this way, that every berry be crushed; if even one remains whole, fermentation will surely take place. I use a silver fork and plate for this purpose, crushing only a few at a time. If properly done they will keep indefinitely. I have currants put up in this way two years ago, and they still retain their natural color and flavor. Blackberries and raspberries preserved in like manner are very nice. For pears, use the following: Pare the fruit and cut in halves, remove the core, throw into cold water to keep from being discolored. Use one pound of sugar to three pounds of fruit and a quart of water to three pounds of sugar; when the syrup is boiling, take the pears from the water and drop into the syrup; cook until they can be pierced easily with a fork, fill the jars with the fruit and fill up to the brim with syrup. Strain the syrup that it may look clear in the jars. Plums are preserved in about the same way as other fruits, sweeter varieties requiring about half a pound of sugar, and the sour plums about three-quarters of a pound to a pound of fruit.

While it is generally understood that jelly can be made from any kind of fruit juice, some of the jellies made from some kinds of fruit will prove to be only a thick syrup, while the combination of some of the fruits will give excellent results. The fruits which do not contain pectin, the substance which makes the juice form a jelly, should be used with fruit which does contain it.

Raspberries, strawberries and cherries need the addition of currants; barberries, peaches and pears need apples, plums or quince to make a perfect jelly. The juice that is strained without any pressure makes the clearest and nicest jelly, and is of much finer flavor when the sugar is not boiled long with the fruit. If possible, strain the jelly before pouring into the glasses; fill each glass full and when cold pour over the top melted paraffine to exclude the air, then put on the tin cover.

In preparing this paper I have mentioned only the varieties of fruit raised on our own farm and my method of canning and preserving them.

The market is flooded with bogus preserves and jellies as well as other food products, and these are used only for want of a pure article. Some active measures should be taken to protect from the injurious effects sure to follow the use of these compounds, made from anything and everything save fruit, and the best way is to so utilize the surplus from our gardens and orchards as to educate to a clear distinction and cultivate a love for the best which will always satisfy. Our pomological interests suffer from the presence of these compounds and well organized and concerted effort alone can so multiply the genuine that no one will accept the frauds. Here is a field for the skilled housewives on Maine farms to cultivate and there are substantial returns waiting the effort.

CARE OF PLANTS FOR HOUSE AND GARDEN.

By Miss G. P. Sanborn.

Having had some experience in the last few years in growing plants and flowers, we will talk a few minutes of a few very simple things which may help those who wish to grow plants in the winter in their farm-house windows.

It is one thing to grow plants in a house heated by steam or hot water, and another thing to grow plants in a house with stoves and wood fires—the preference being in favor of the farm-house with the wood fires. Of course those of us who keep house plants have a garden or beds for them in summer, out of doors. When August comes and we must begin to plan for our winter window-garden, the first question is, "What shall I do with all of my plants? They are so large I have no room for them, too large to give away, and it is too bad to let them freeze." And there is no need of this. Every farmer has a cellar for storing vegetables—this is the place to keep your large plants.

We will begin with geraniums, which are the most satisfactory. In August take off your slips, put them into the ground close beside the plant you take them from. This gives them shade, which they must have, and you know then what your slips are like. When cold weather comes, your slips are just right to put into small pots—*small* pots—small pots, remember, and will bloom all winter if you keep them in small pots, and be handsome plants for the garden, the coming summer. The old, large plants from which you have taken your slips, are taken up with earth left on the roots, placed in a shallow, rough, wooden box, soap box, anything, and carried to the cellar. During the winter, when the weather is mild, water them; three or four times is enough. The leaves will fall off, the branches will dry and die too, and when the time comes to bring them to the light again they will be a sorry looking lot. About the last of March or the first of April, bring them up, shake off the old earth, cut off some of the large, hard roots, cut off all the dead wood down to where it is green and hard—no matter if it is within three or four inches of the pot—then put them into small pots with new earth. I said small pots. Place them anywhere in the light where they will not freeze, and soon new leaves will make their appearance. Now feed them with good manure water and keep them in small pots—*small* pots—small pots—and long before it is time to put anything out of doors they will be full of flowers. These plants well cut back, as we have mentioned, will grow round, even, full and bushy, giving you a very handsome, ornamental plant, instead of the usual Shanghai style so often grown by the amateur, while it has a great many more flowering stalks, so you will have almost a globe of blooms.

Geraniums grow and flower better in a dry soil. So much for our geraniums. We have two other plants just as desirable though not as much grown. The best one is snapdragon. One paper of seeds costing twenty-five cents will supply a whole neighborhood. Plant your seeds in a box two or three weeks before time to make your garden. In May put out your little seedlings. In late summer and all the fall you have handsome plants of dark green foliage, with long spikes of dainty flowers—white, pale pink, lavender, lilac, and various other shades. Just before the frost comes, lift your plants, cut off all the old hard growth, snip off the blooms and buds, place in as small a pot as you can and not destroy the working roots, and put them in any sunny window which you can spare. These grow better very cool, with plenty of air. During the winter, and all through the winter, you will be favored with these delicate, long, slender spikes of flowers. These remain in bloom a long time and are much sought for during winter as table decorations. They do not easily wilt and remain fresh for ten days after being cut. This plant is very desirable from the fact that it will stand the cold. I have plants in my garden now looking just as bright and fresh as though freeze and frost had never been heard of.

The next plant worth having and which helps make a variety is the Nicotiana. Plant the seeds out of doors in spring. It will bloom all the fall. Then lift, place in pot or small box or tomato can, old sugar bowl or anything *small,* cut it back to six or eight inches of the pot. New shoots will put out, and when the sunny days come in January, February and March, this will continually bloom, giving you a white, bell-shaped flower, very fragrant and delicate.

Another thing which we have learned is how to grow sweet peas in winter. For a window take a piece of coarse hen-wire the size of the lower half of the window. After this is fastened on the side of the case next to the room, make a narrow box about six inches deep and the width of the window sill. The last of January or the first of February, in earth not too rich, plant mixed sweet peas. These will stand lots of cold, too. When these sprout, you will find that they grow very slowly at first. When about ten or twelve inches tall, pinch off the top, which will make them branch out, then snip the branches. This will fill your netting of wire full of foliage and flowering shoots. If it comes a fearfully cold night, tuck newspapers between the wire and the window. This keeps them from the outside cold. Your night fire of course keeps your room from freezing. You will find also that these need lots of water, especially after they begin to flower, and be sure that you let no seed-pod form—these deplete your plant and you fail to get your flowers. In the early spring, when there is mud everywhere and it seems as though summer would never come, you will have these beautiful, fragrant flowers, so suggestive of cool summer mornings and long, sunny afternoons. There is nothing sweeter, prettier and more tasteful in the shape of a flower for the sickroom. These four things which I have mentioned will stand lots of cold. That is why I speak of them as especially desirable for houses where wood fires are depended upon. I used to find my geranium leaves and branches in cold mornings frozen on to the windows, and the rooms so cold that very thin ice would form. Just as soon as the sun shone they would thaw from the windows and look as fresh and bright as though nothing unusual had happened. In the coldest weather, in cool rooms, I find it best to keep the earth quite dry.

Ten-weeks stock makes another fine house plant. A few seeds planted the last of the summer, kept well manured, will soon germinate. When cold weather comes, lift these into small pots—small pots, remember,—or tomato cans, or any small dish which you can spare, and if the plant runs up tall and thin, pinch off the top. This will branch it out and if you feed these, give them light, sun if you can, plenty of air and lots of water, you will have a wealth of sweet flowers. And if your seed are the Princess Alice variety, double, it will be better to cut your flowers as soon as well developed, to have your plant grow large and remain prolific. Just before I started off yesterday morning I found in my garden a bunch of calendulas. These are a late growth out of doors and the whole bunch put into a small pot will give bright yellow flowers the whole dark winter through.

You see I have rung the change on small pots. This pot question is the one bane of home plant culture. It is the great bugbear of the florist. We sell a plant to a customer all ready for the winter growing. It is sent home in the morning. By afternoon of the same day a boy comes and says, "Mamma wants a big pot." In the course of a month the customer appears with a woeful complaint. "That plant I bought of you hasn't grown one bit. I don't know what ails it. I have done everything to it. I never could make plants grow." Then I ask, "What did you do to it?" "Oh, I did everything," is the reply. "In the first place I put it right into a large pot just as soon as I got it home. Then I watered and watered it, then I put in new earth and took a great big pot this time. Well, I did everything and that plant won't grow. Plants never do grow for me." Now that poor plant had been tormented to death. If a small plant is in a large pot, the plant itself will not grow till the jar is full of roots, and while it is making roots it will grow no flowers. This is why I have reiterated small pots, small pots. When the pot is once filled with roots then your plant grows, throws out flower shoots and buds, and if it is flowers you want you must keep the plant in a small pot and feed it well with manure water. The less root room, the more foliage and flowers if well nourished.

Bulbs are inexpensive, take little room, will grow in cool, airy rooms, are very little trouble and a great satisfaction. Easter lilies are lovely and can be easily grown. If you buy large bulbs, put them in five-inch pots, water well, put in dark place till the pots are filled with roots, then bring them to the light and sun, keep them well wet down with manure water till color shows on the bud, then use clear water. If you continue to use the feed it will turn the edges of the flowers dark. Gladiolas are fine for house plants. If you have room you can have boxes of them full of flowers, as early as February and March. The light shades are the most desirable. The mammoth oxalis is beautiful. A dozen bulbs put into a hanging pot—this will take no space—and if you have all yellow ones, which I think much the prettier, you will get a bunch of sunshine for your pains. Dutch hyacinths, three or four in a pot that will just hold them, placed in the dark till the roots grow; then bring to the sunlight gradually, and you have something to feast the eyes upon. As soon as the flowers die, dry off your bulbs and keep them for the garden. There are several colors of these, white, lavender and pink being the favorite shades.

Freesias are very inexpensive little bulbs. Put a dozen or two in a tomato plant box, keep them in the cellar in the dark till the sprouts show above the earth, then bring to the light, and you will have as handsome a bouquet as you can wish, of tiny white and lemon-tinted, bell-shaped, delicate flowers.

Ferns and foliage plants are always desirable and can be grown in the windows much easier than is generally supposed. If we could always remember to keep our ferns in the shade and our flowering plants in the sun, we should be more successful; and ferns, dracænas, palms and araucarias will keep well and look well and be ready to grow in the spring when their time for growing comes, in a very cool room. There is one great mistake made with ferns. It is natural for the most of them to die down to the roots once every year. Most amateurs think they are dead. They are only taking a little rest. Not many know that the delicate tropical maidenhair can be frozen solid, taken in, thawed, placed in the warm sun and grows again, long, fine, graceful fronds. Flowering maples give good satisfaction, as they will stand any amount of abuse, and if kept in a small pot, fed well with manure water, they are graceful of foliage, and not to be despised flowering plants.

I have spoken of these few common things because I know they will grow and pay the grower for her trouble in an ordinary farm-house, with only the heat from the kitchen stove and the sunny south windows. I live in one of these same little farm-houses, just out of the city limits, one story high with low ceilings, medium-sized rooms and the sunniest south windows possible. There are no carpets for the sun to fade, so I bring in plants, any or all kinds, and keep them for months, where they always do well. I have not mentioned that it is well if you can to spray the leaves of your plants. You can take them to the sink and use a whisk broom. You can shower your sweet peas just where they are. If you get your windows spattered with dirt and water it won't show.

For the summer garden we have all of these plants which we had in our windows, excepting the sweet peas—which is a good beginning. For the busy housewife who does all of her housework besides taking care of the children, doing the mending, knitting, making butter and perhaps cheese, and possibly spinning all the stocking yarn, I should not recommend many seedlings or annuals for out of doors. Perennials and shrubs are so much easier and they are always there. A few loads of dressing wheeled around the roots in the fall is something which ought to be done, and if you can, have some one drive a stiff stake near each bush and tie the branches close together to the stake. The heavy snows will not injure them. Spirea Van Houtteii is one of the best shrubs. It is always pretty and graceful out of bloom, but when in full flower it looks like a bank of snow. I greatly prize one I have by a low, sunny window.

Golden glow is another plant which when once established is well worth the trouble. It grows tall and has a wealth of handsome yellow flowers, something like chrysanthemums, always yellow, splendid for cutting. Delphinium is another grand plant. Dr. Young of the health department at the State House, has in his garden a root of this which has reached enormous size. I went there one day to buy some tall cut flowers for parlor decorations for a customer. These long sprays stood twelve feet high and the big root itself was fully eight or ten feet in diameter. The color of the flowers ran from dark purple through all the shades to light lavender and white. Now this is something any one can have—for I immediately sent away for a root and got a small one for fifteen cents. Then I planted some seed—all grew finely—and I hope some day to have a large bush. These are fine for cutting, as they keep a long time in fresh water. This summer I planted two castor oil beans in a sunny corner where there was plenty of moisture. They grew ten feet tall, with leaves eighteen inches across. They looked decidedly tropical.

I have a little back piazza where I keep the step-ladder, mop, slop jar, wash bench and wringer and lots of things. It is sometimes a rare sight for high-toned customers who come to the greenhouses, so I thought I would have a bower and screen. We procured some beans, scarlet runners, planting close together, placing bean poles to run on, and found when summer came we had a solid shade of handsome green, covered with bright scarlet flowers, reaching to the eaves. Besides, when the time came, we had plenty of string beans, and delicious ones, too, from these same vines.

No one in the country should let a spring go by without planting a sweet honeysuckle by the front door, if they have not already done so, and a clematis beside the porch door. This last is a new Japanese climber, perfectly hardy, and has clouds of fine white flowers, remains in bloom more than a month, requires no especial care. Of course you expect to give everything some dressing, which is always a protection if put on in the fall.

There are plants and plants, but these few common ones for house and garden which I have mentioned, are the ones I have tried and am sure of. These will thrive under adverse circumstances and fully repay the grower for all the pains she may take.

NATURE STUDIES FOR THE FARMER'S BOY.

By Mrs. V. B. DeCoster.

It seems strange to us country people that many people in large cities can live next door to others for years, without knowing them by sight or even learning their names.

And yet we country people do almost the same thing.

We have many good neighbors living on our own farms, who are a great help to us in many ways, with whom we never form the slightest acquaintance.

Why, there are families of birds, butterflies, insects and plants of wonderful beauty and interest, if we only get an introduction and cultivate their acquaintance.

Everyone who lives in the country should know these neighbors better. We need never be lonely. The children can always have playmates. Nature Studies open a new world to them.

It is not enough to know the names of the birds about us, we should learn their habits, song, and especially their favorite food. Many of them are valuable friends and can often be encouraged to make their homes near us by planting shrubs or trees which bear their favorite fruits, and by giving various helps in nest building. The *Baltimore Oriole* and several other kinds help to destroy our apple tree caterpillars.

In most town and city schools Nature Studies form a part of the regular course. In our small ungraded *country* schools, we seldom have a teacher capable of teaching them. Even when they know how, they have so many classes in the "3 R's," it would be hard to find the time.

But only think of the possibilities! If the farmer's children could only be taught these things right where they are surrounded with all necessary living object lessons.

Although it is a grand thing for city children to have access to the fine museums and Natural History rooms, a child could be taught more in a half day, by a brook and meadow, than he would learn in a whole term from dead specimens. He needs to see the *living objects* in their natural homes.

There is just as much difference as for us to try to get acquainted with persons by their photographs and what people say about them, compared with visiting them in their own homes and talking with them.

Nature Studies are one of the best means to teach children to be observant and to study and investigate small things which would not be noticed by ordinary people.

They also teach patience, gentleness, perseverance, art, love and reverence.

Of course it would be impossible to teach any child all of the varieties of birds, flowers, insects, stones and trees, to be found even in their own locality.

But it *is possible* to awaken an interest in these things, teach him a few fundamental principles, and furnish him with means to continue his studies alone.

In some of the European countries they have established "School Gardens." These are often quite large gardens where the scholars each have a plot of ground and do the work of practical gardening, and take the different branches of Nature Study. As long ago as 1880, Sweden had over 2,000 of such School Gardens. The Swedish emigrants to this country are more sought after as gardeners and farm laborers than any other class, and the reason is supposed to be their efficiency and habits formed in childhood at these gardens. Austria and France also have many such schools, and they are fast gaining in reputation in other countries.

The United States seems to be considering the needs of such schools, as they have recently had the consuls in all those countries send a report of these schools to Washington, which have been printed in a very interesting, illustrated report. The State Board of Agriculture of Massachusetts has also begun the publication of Nature Leaflets, which will certainly accomplish much good, if distributed in the right places. I have also heard, on good authority, that a similar work will be taken up in Maine.

The long vacations of our country schools which often seem half wasted have so impressed me, that about a year ago, I began a little work among the children of our district that I think could be successfully carried on in many other country neighborhoods.

During the long winter vacation, I had the children meet at my home once a week, then after school began, the teacher gave me an hour of the school time occasionally. During the winter we studied from seeds, trees, leaves, mounted birds, butterflies, minerals, etc. Then as spring came on they watched the buds of maple, alder, willow, hazel, etc. They started seeds of tomatoes, celery, pansies and other flowers in the house.

This fall we have been studying bulbs. The children became so interested that they decided to have a tulip bed at the schoolhouse. In order that they might fully realize its value and feel a true interest and ownership, I told them not to ask anyone to give them the money but for each one to earn what they could, and tell me how. The pennies soon came in, earned in many ways, such as picking apples, tending baby, milking, cutting corn, picking up potatoes, janitor work at schoolhouse, cleaning the hen house, and one little girl had had her choice in having a tooth pulled, either to give the dentist a quarter for cocaine to deaden the pain, or have it pulled without anything and keep her quarter for tulips. Although it was a large double tooth, not loose, she had it pulled without flinching, for the sake of the lovely flowers. I told them I would earn enough for the fencing, for we did not propose to have the neighbors' hens and children in that garden. Some of the big boys spaded it up and brought dressing and put up the fence. And a good lesson was learned when the bulbs were planted. They have a bed three by fifteen feet with several dozen tulips, daffodils and narcissus, all snugly tucked into their winter bed and covered with a blanket of fir boughs. If any of you go past East Buckfield during the month of May I want you to be sure to notice the tulip bed.

Right here, I will anticipate a question which some of you busy mothers may ask, "How can a woman with a family find time for such things, without neglecting her housework?" That depends on the woman and upon what she considers necessary housework. A woman with only two in the family can find enough to keep her busy all of the time, if she is so disposed. Or, she can make a study of economizing time, strength and labor and still do what is necessary for the best interests of her family.

If a little hand steals into mine, and a childish voice pleads, "mamma, won't you go to walk with us?" or "mamma, do please come down to the brook." The chances are, the family may have to go without cake for supper or pie for dinner, or the white clothes may be very much slighted in ironing. However, they will have enough good wholesome food and clean, comfortable clothes, although they may not have so many tucks and ruffles as many others. In future years, I had rather my children had the memories of our walks and studies together than to say "my mother was an immaculate housekeeper."

Now the next question some woman will ask is "How can they teach what they do not know themselves?" That is more easily answered. There are books, books, wonderful books! With illustrations upon every branch of study you may desire.

Can't afford them? Oh, yes, you can, you spent many a dime and quarter which you might save and fifty cents, yes there are many nice books for even a quarter. After you once get children interested, they will bring things to you and hunt them up in the books. It doesn't take very much time after all and how could it be better spent than keeping in touch with the children? Why, there are books on flowers in which a child six years old can find almost every specimen in this town.

There is a dear little bird book for only sixty cents so arranged that you can learn the name and habits of almost any bird you may see in New England. A two cent leaflet gives a table concerning the foods of different kinds of birds. There are books on insects which tell of all the wriggly things a boy finds in the brook, of the beetles under the rocks, of the caterpillars eating our plants and trees and the miracles of their transformations into beautiful moths and butterflies. Books that will open our eyes to see many wonderful things about us of which we never dreamed.

One day last summer I was showing an old man some butterflies and telling him the life histories of some of them. He pointed to a large yellow one, with black bands, which the children call Deacon Turnus with his swallow-tail coat, and said, "I saw one like that yaller one, once, just as it hatched out. I remember it was in the year '61. I was settin' under an apple tree when sumthin' dropped on to the ground and I picked it up. It was one of them yaller and black butterflies, all wrinkled and soft, jest as it hatched. I carried it into the house and watched it awhile. Before night he could fly all around.

Think of it! A man nearly seventy years old, so interested in that one butterfly he could remember even the year, almost forty years ago, "in '61," and that was the only one he had ever seen while living on a farm all his life, with thousands of such transformations going on about him and he was blind just because no one had ever told him when and where and how to look.

Children will see many things which vitally affect the success of the farmer. For instance, one day last winter we were having a lesson on the bluejay. I asked if anyone could tell me anything interesting about the bird. One boy said that a short time before he was out in their orchard with his father and uncle and they saw a bluejay very busy among the apple trees. His father said he was going in and get his gun and shoot the bird because he was "budding the trees," but "after father went in I just crept up close where I could see and I found he was eating caterpillar eggs. He would twist them right off with his bill and eat them and I just hung some ears of corn in those trees so as to keep him there." This same boy in summer walked a mile to bring me a Luna moth which he found on a butternut tree.

A little girl only four years old, brought me a piece of a cabbage leaf, no larger than a silver quarter, which she had picked in the garden, and asked me what it was upon it. Upon looking closely I saw what seemed like a dozen short white hairs, less than half an inch in length, standing erect and on the tip of each one was a tiny, light green egg. Upon looking it up in one of my books I found it illustrated and described as the eggs of the Lace Winged Fly. The flies I had often seen in the garden but did not know what they were. These eggs hatch a small worm or larva called the "aphis lion," aphids are commonly called plant lice. And he truly was a lion for I kept one under a lantern chimney and supplied him with leaves covered with aphids and it was wonderful how fast he cleared these leaves. These aphis lions at maturity spin a round cocoon in which they develop into the dainty light green, lace winged fly.

I noticed one Japan plum tree whose leaves were all curled up from having their juices eaten by the aphids until the aphis lions cleaned them off, then the new leaves grew out smooth and perfect, presenting a great contrast. These ought surely to be cultivated in sections troubled by the pea louse, of which there was much complaint last summer.

A lady who owns a greenhouse once said to me, "teach your children about plant lice and ants." When I first began in my greenhouse I noticed where there were many plant lice I often saw ants running about among them and so encouraged the ants thinking they were eating the lice, but after awhile I found out that the lice were the cows of the ants. Ants will gently stroke the lice with their antennæ and the lice will secrete a drop of sweet fluid from two little projections upon their body which the ants drink. Moreover the ants will take the eggs of lice into their nests and hatch and rear the young.

As we look at the bountiful crop of fruit this year and recall how our trees were covered with caterpillars last year, the leaves eaten, the crop ruined, how many can tell whether it is chance, climatic conditions or in accordance with God's laws. If you had seen some neighbor go into your orchards last year and kill off most of your caterpillars you would have thanked him, at least, perhaps offered to pay him something. But this is just what did happen in a large measure. One of those little neighbors with whom we are not even on speaking terms and but few of us even know by sight and who so resembles a wasp that most of us would be frightened if one lit on our hands,—those little neighbors which are called Ichneumon flies, were very busy laying their eggs on those same caterpillars which hatched into little larva and eventually destroyed the caterpillar.

One of the laws of nature is that every insect, every plant, in fact every living thing has its foes. Were it not so the earth would soon be overrun with the strongest of some few species. Whenever an insect multiplies to a great extent then you will see some parasite multiply in proper proportion for their extermination.

Another little insect not half appreciated is the honey bee. Most people think of the bee only as furnishing honey, when in reality we are largely dependent upon it for flowers, fruit and vegetables, as many of them are almost wholly fertilized by bees carrying the pollen from one blossom to another. Grant Allen a noted English scientist says that in England they do not have insects necessary for fertilizing melons, cucumbers and squashes.

Oh! there are so many common things which make life rich and sweet and beautiful if our eyes are only opened to see them. That is what we must do, open the eyes of the children, teach them to look for these things, then year after year they will lay up a store of knowledge and learn to love the farm. City life will not have such overwhelming attractions. We are often told that the best way to "keep a boy on the farm" is to give him a lamb, some poultry or other live stock or some share in the fruit whereby he may earn some money for himself. But I say, begin back of that, before a child is old enough to learn the love of money he can be taught to love nature.

SAVING A FARM.

H. W. COLLINGWOOD, N. J.

There are two things in this world for which no measure has ever yet been found. One is the possible crop that can be grown on one acre of land. I don't think any man was ever foolish enough to say that he had grown in any crop all that can possibly be produced on one single acre. That crop has never been measured and I doubt if it ever will be. In like manner no one has ever yet measured the possibilities for good or evil of a full blooded Yankee. The impossibility of measuring the possible crop an acre of land can produce and the impossibility of showing that a Maine Yankee has ever done all that he could! I want to put these two things together and see what we will get.

I never was in Maine but once before. Twenty-one years ago I ran through the corner of the State. I look back twenty-one years and it seems something like an old story. I went through New England on a flying trip. I was one of the boys who made up their minds that there was not a living to be made in New England. I went through bound for the west.

At that time thousands of your best young men and women complained that New England no longer furnished any opportunity for them, and they were going west to Kansas and Nebraska. I know the cars were crowded and at every station young people got on the train all bound for the west. They were going away from New England because they could not "make a living on these old hills." They were going where land was not "played out." I have come back to the east to end my days on a farm, and perhaps the story of why I turned back from the west, why I changed my mind, why I now know that there are opportunities for the farmers of New England to make a living, that is the best story perhaps, that I can tell to you to-night. Twenty years ago there was a time when depression seemed to hang all over the east. You and I know how many of the neighbors pulled up and went away. You could not keep them here; they went "out west." So year after year the population dropped steadily down, down, down. You could not keep them here, and for thirty years after the war there was a steady loss of population, which was taken away from the east and dumped west of the Mississippi. Now what was this that took the men away from the east? It was in the very air. These people had the idea that beyond the Mississippi there was a land where people could get something for nothing. Far back before the war, the farmers on the hills of New England were prosperous as they never were before.

They were a simple, plain, God fearing people. They asked odds of no man. They looked every man in the eye, and if they did not like him they told him so. They were a strong, fearless people, the best sort of people the country ever produced. My grandfather tells the story how the farmers from Northern New England came to Boston fifty or sixty years ago. They would wait till the snow came then they would load with wood, wool, dried apples, wax, and maple sugar and start off for Boston. The day before they started the housewife would take the big iron kettle and boil it full of bean soup; then set it out and freeze it hard and turn it out in a solid block. Then the next morning the farmer would bore a hole right through the middle of that soup, hang it on the sled and throw a cloth over it and carry it off to Boston. When they wanted dinner they would take a hatchet and cut of a few slivers of that bean soup. That is the kind of people that made this country. These people made America what it is to-day. That was the kind of people that cut slavery away from this country. When the history of the great boundless west is written as it ought to be do you know that nine-tenths of its greatness will be traced back to the pork and beans, the fish balls and the doughnuts eaten in the New England kitchen 100 years ago? Many of the abandoned farms of New England were deserted because the son or brother was killed at the front. Among the noblest monuments to the American farmer are the silent farm houses with the windows nailed up standing alone on the New England hills. Many of these soldiers when they came back were not satisfied with New England. The men get the microbe of roving in their bones. The government wanted to settle the west for various reasons. The rural villages of the country were flooded with railroad circulars, and papers and books which told of the wonderful west. They made our young men and young women discontented and it kept on so that until 1890 there was a steady decrease of the population of Maine, New Hampshire and Vermont.

Now I have heard western men make this prophecy, that the centre of government of this country is bound to jump across the Mississippi. They say New England is doomed. It has done enough for the country! The old farms of New England must be abandoned, and let the woods come back to claim its own. They pretended that this New England of ours could not live. Year after year, they said, you would find the population going west. "Only the old men remained at home." They said "the west is the place." "New England is not in it."

The census of 1900 just completed shows that at last the tide has turned and Maine is gaining population faster than Kansas. Kansas with all its wealth and all its "boom" and all its boundless prairie. The State of Maine outstripped Kansas and the states of Vermont and New Hampshire outstripped Nebraska!

The three New England states, Maine, New Hampshire and Vermont in spite of their age have gained in the last ten years 15,000 inhabitants more than these two great western states. The tide has turned for the New England States. Men are now glad to get back to the farms of New England. They are glad they went west to see the country, and glad to get back again. The tide has turned, but some will say, "the milling and manufacturing counties have gained in population, that it is not a gain in the rural counties." That is where they make a mistake, the fact is that the rural counties of these States have gained faster than any other state in this country except one, Oklahoma. The tide has turned back to New England. I wish that some of the money that has been spent out west would also come back to New England.

People were told that they could get twelve per cent for their money by building up western towns and farms and they saved every dollar to send there for investment. Much of it was lost.

If the Yankees of New England had been wise enough and shrewd enough to invest every dollar of that money in New England, I tell you New England would be a grander place than it is.

Now why are these men coming back from the west? Why is the tide changed to New England? There must be a reason for all this. In the first place the people say there are better chances near the coast. There are two things which enter into the job of making a living; the cost of producing and the cost of selling. It takes so much money in Maine to produce a barrel of apples, and so much in Kansas to produce another barrel. The Kansas barrel is probably cheaply. You can probably produce them for less money in Kansas than in Maine but how about the markets? If you will draw a line twenty-five miles west of New York and run that line right through Lake Champlain and then stop and see what you have got, you will find that you enclose the homes of eight or ten million of people. It is the best market on the face of the earth. You will find more people who demand every fresh dainty and delicacy, than you will in any other place of equal area on the face of the earth! I say a man who is right here inside this area has the advantage of the market over a man 1,000 miles away. They find they can produce almost everything in the west at a lower price than they can on the New England hills, but when it comes to selling, what then? The western farmer is suporting three families. His own family on the farm, and the families of two other men that stand between his farm and the consumer, but who pay absolutely nothing toward handling the crops which he produces on his farm. These men who went to Nebraska and Kansas and even farther west say that it cost so much more to market their crops that they are receiving less for their labor than the New England man.

These men say if they were back on these old hills they would at least be in "God's country." "If I were only back in God's country!" I have had people tell me that many times in the west. "If I could see the Hudson, if I were only back in God's country!" Say what you will of New England, it is the place to live in, it is the place to die in. It is the place for young men and young women. It is the place for men of middle age. It is the place for the old man, where his ancestors lived, where his children were born. New England is the place! New England forever! If you were to say truthfully where you would rather spend your declining days the majority of you would say, "I would rather go back to the old homestead, back amid the scenes of my childhood." I have in my pocket a letter, one of fifty which I have received in four months. It is from a physician who states that his family is not well; he does not get on well in his profession, he has got a little property but it will be only a little while before that is used up, "Can I make a living on one of those run down farms in New England?" he asks. I have a letter from my bookkeeper in New York, one from a Brooklyn man, and two from Jersey City. I know that there are thousands of this class of people who are driven out of the cities and long to go back to the farms. Do you know I think this is going to be a good thing for the farms. It is bound to be a good thing for agriculture, and a good thing for New England. You know that since these great corporations have been perfected many young men feel that they are being driven out of business and trade. I am not an old man, but I can remember that when I was a little boy living in a town in Massachusetts, such work as digging ditches and digging sewers was done by such men as my father, who belonged to the middle class of people. They did not lose their self respect by doing such work. I remember that all of a sudden these Yankees disappeared and the ditches were full of Irishmen and the pay went down to $2 a day. Afterward the Irishmen disappeared and the work was done by Italians and the pay went down to $1.75. I have seen the time when the Italians disappeared andthe work was done by Canadians for $1.25 and they were folowed by Huns. I have seen that work done to-day by a machine, a "steam Irishman" at a cost of fifty-five cents per day for a man's labor.

I believe that every industrial change that comes to this country offers the farmer a chance to do better than ever before. I find plenty of men who look me in the eye and say "I am doing better on the farm than ever before, because I am raising different crops in a different way." It is a definite law of nature that every industrial change offers new opportunity and new power to the farmer who will only take hold of it like a man and fight for it. Here in the State of Maine you have the ideal rural community. I don't believe the old rural community is passing away. In this State you preserve the old character, the old tradition, and the old simplicity of living.

The Maine farmer of to-day does not need to run away to the West. All about him are glorious opportunities to save and make over the strongest and best of soil. Save a farm! Save a farm from the wilderness! Save a farm for your country. Don't let the woods claim it again. Don't let the wilderness grab it, but stand by that farm and save it, and fight for it. Save a farm, the noblest work a man can do. Save it for your family and country! I know of people who used to say this, "Farming in New England is dead, because the farms are worn out." That is where these people make a mistake. Soil is never worn out. That is not a piece of ground on the face of the earth that is "worn out." I believe that for 265 years the gardens in Plymouth have produced vegetables and I don't know now many years before that the Indians raised their corn there, and they still produce the best of crops. Land cannot be worn out in less than 5,000 years! I believe that a soil will lose its character. I will tell you what I mean. As an illustration, you have perhaps known in your life some great, big, powerful man, strong of heart and soul, looking you right in the eye. That man goes wrong and the world points the finger of scorn at him; he loses his reputation, his "character." His muscles are as strong as ever, but through lack of character his powers are wasted. Something you cannot estimate or analyze or weigh comes into his life and saves him. Then you have seen a change in that man. He throws back his head and his shoulders, his character has been restored. Now the so-called "worn out" soils of New England have lost their character. I can make more money by buying land that has lost its character and putting that character back than I can in selling stocks with the same amount of money.

How can you bring character back to soil? You can't sit down in a chair and scratch your head and do it, but you must scratch the soil. You have got to work hard for it. I own a farm of ninety acres of abandoned land in New Jersey. The farm I live on takes care of fourteen people. It was a farm on which a mortgage was foreclosed before I took it. Three families failed on that farm. Why? Because they did not recognize that the land had lost its character. I almost lost faith when I saw that land. I went up and looked it over and remembered my experience with the Southern cow pea. I plowed the ground, broadcast the peas, plowed them in, and the next thing we were beginning to see the character of that soil coming back. It came back by leaps and bounds and we are able to grow corn by using the cow pea where even rye would not grow.

A farmer I know said to me, "I want you to look at that wheat and tell me if you can't find a little tract that is a little better than the rest!" I went into the centre of the field—a blind man could have told the difference. I asked, "What have you been putting on, 'Jim Jones' phosphate?'" "No, sir, I plowed in there a crop of Southern cow peas, two years ago." There is not an abandoned farm that cannot be brought up by the use of the cow pea, clover and lime. These things will do it for you, I know it because we are doing the same thing in New Jersey.

It is a great honor for you to make such an exhibit of apples as you show here. My business takes me everywhere and I see all these exhibitions, and with one exception I have never seen a better display of first-class apples than you have here to-day.

Where you can produce such apples as these, where you can put them on the market as you do, there is no country on the face of the earth that can compare with you in the production of fine apples. Think of your advantages in regard to the market, how you can reach these markets and control them! The day has gone by when you can produce forty or fifty bushels of potatoes to the acre and make it pay. It will not pay you to raise rye as you used to do. If you stick to your fine vegetables, your apples and fruit as your principal products, you will always have a ready market for them. In the face of the fact that science is telling us how to redeem these old farms, he would be a strange man who would say that Maine agriculture is doomed and there is no chance for him here.

As the white is coming into my hair and as I begin to realize that perhaps my best day's work is done, I feel surer if I can live to say that I have saved a farm I shall not have lived in vain. I hope to be able to say at the close of life, "I have saved a farm! I have done something for my country, I have done something for my family, I have saved a farm. It stands as a monument for all that is good and true in me. I have saved a farm, I have done my duty!" If any one of you can live to say that you have kept the wilderness back from a farm, and saved it from the forest, you will indeed be worthy of the proud name of American freeholder!

Mr. Collingwood then referred to the time when he was a little boy and pumped the church organ in the little church on the hill, and repeated a poem which he composed when in the West far away from the home of his childhood.

SECRETARY'S PORTFOLIO.

We herewith give space to a large part of a bulletin issued by the Vermont Agricultural Experiment Station entitled "Apples of the Fameuse Type." Our fruit growers will find this history and description very interesting, as apples of this type are amongst our most profitable for the home market. They are early and abundant bearers with many good qualities and few defects except the liability to attacks of the apple scab.

INTRODUCTORY.

The second revision of Downing's "Fruits and Fruit Trees of America," which is the standard work on descriptive pomology for America, names 1,856 varieties of apples. This list was published in 1872, since which time there have undoubtedly been some hundreds of varieties introduced. In 1892 Bailey made a list of the apples offered in nurserymen's catalogues in the United States and Canada, and found that there were 878 varieties then named, propagated and held for sale.

Besides the varieties sold by the nurserymen at any given time, there are always many more not generally distributed but kept, coddled and prized in private collections, in small neighborhoods, or in out-of-the-way places. It seems a very moderate estimate, therefore, to say that there are 1,000 different kinds of apples in commercial circulation on this continent to-day, that there are over 2,000 varieties described in contemporary literature, and that there have been more than 3,000 separate sorts named and propagated in America within the period covered by our brief pomological history.

The impossibility of any man's knowing all varieties of apples will be evident from the foregoing considerations. These thousands of varieties are separated from one another by infinitesimal shades of difference. Some of them can hardly be told apart by the most expert pomologists and after years of acquaintance. The cultivated apples are remarkably homogeneous. They are (with very minor exceptions for certain crabs) derived from one original species. Compare this with the cherries,—two or three hundred varieties derived from two species,—or with the plums, where a thousand varieties are derived from ten or fifteen original species. In no class of fruits, unless it be possibly the strawberries, are varietal distinctions so thin and vexatious as in apples.

But while the characteristics of varieties of apples, taken all together, are so confusing, there are a few pronounced *types* which the horticulturist may fix in his mind, and round which cluster certain *groups* of varieties. The Fameuse presents such a type. There are several different apples of the Fameuse group, all differing measureably from Fameuse, but all conforming closely enough to the Fameuse type so that their close relationship with one another and with Fameuse may be readily recognized by the pomologist.

If the reader will consider the foregoing paragraph closely he will see what is meant by the important terms "type" and "group." They present the essentials of pomological classification. If our multitudinous variety are ever to be classified it must be by putting them into groups; and these groups must cluster about the more conspicuous, permanent and recognizable types.

In common language these groups are sometimes called "families," and some men speak of the "Fameuse family," the "Ben Davis family," etc. The idea is the same; but the terms "type" and "group" are more precise and convenient, aside from the fact that the word "family" has been pre-empted in plant study with another technical meaning.

II. THE FAMEUSE TYPE.

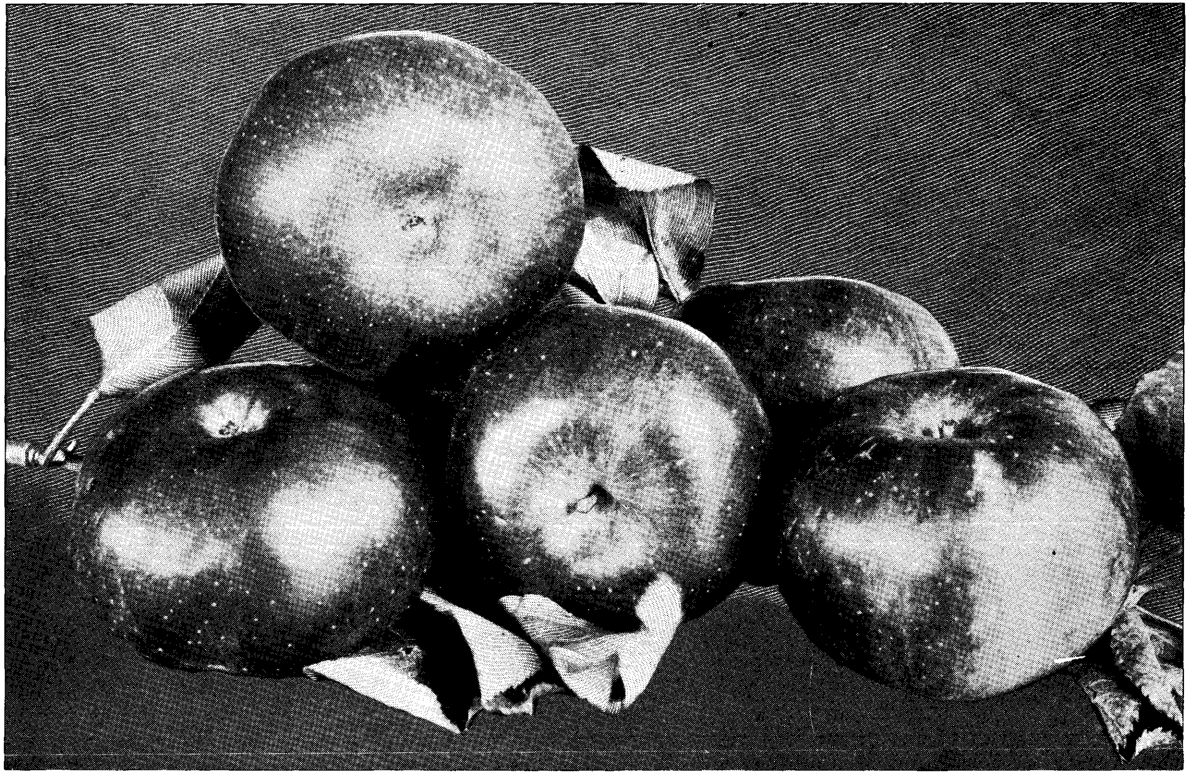
Of all the types to be discovered among our cultivated American apples, the Fameuse is one of the most prominent, persistent and important. Fameuse itself is known over a large part of the country, is a favorite dessert apple almost everywhere, and is one of the most profitable commercial varieties in several important apple growing districts. The variety is widely distributed, well established, almost everywhere known, constant in its general characters, and, most of all, possessed of a proclivity for producing seedling varieties of high quality.

History.—The history of Fameuse is obscure, probably beyond clearing up satisfactorily, but extremely interesting as far as we know or can guess at it. The turning point of speculation for years has been as to whether the variety is of American or European origin. One of the most interesting contributions to this discussion was made by Mr. Chauncey Goodrich,* of Burlington, Vt., in 1851. We quote the following extracts from this article:

"It is here one of the most common as well as oldest varieties; hundreds of barrels are sold in a single season in this town alone. . . . All American writers call it a Canadian apple; of this I think there is no proof. One hundred and twenty years since, the French planted this variety on the eastern shore of Lake Champlain, opposite Fort Frederick on Crown Point, at a place called 'Chimney Point'—more than fifty years before any other permanent settlement. From these old trees cions have been scattered through Vermont, and called the Chimney apple. A very intelligent and highly educated French seigneur, residing on an old seignory eighty miles below Quebec, informed me that this was one of the first varieties of apples planted on the place; that the trees were very old and were brought from France. The early French settlers planted the same variety at Ogdensburg, Detroit, and other places on Lakes Erie and Ontario, where it is still known as the "Snow apple;" also at Kaskaskia, Illinois, more than one hundred and fifty years since, where the old trees are still productive, and apples from them are sent to St. Louis, etc. The same apple may be found in France, and in London, of the growth of France."

"It is hardly to be supposed that a seedling apple was produced in Canada at so early a day as to be distributed more than a thousand miles in every settlement made by the French, one hundred and fifty years since."

* Hovey's Magazine of Horticulture, 17, p. 122 (1851). Boston.



SHIAWASSEE. Grown by D. C. Hicks, North Clarendon, Vt. See P. 86.

Another fact tending to suggest a European origin for Fameuse is that it is usually found in the old gardens, in company with well known European varieties of pears, apples and other fruits.

On the other hand the testimony of European pomologists is mostly against the theory of a European origin. The variety is known in the larger collections of all the countries of Europe, just as Ben Davis is, and has been known there for many years. But most European authors unhesitatingly assign a Canadian origin to the variety; and the variety seems too little known, too little appreciated, and too little at home with European surroundings for us to believe it originated there. Those who call it a European apple usually assign its nativity to France; but Leroy the greatest of all French, and perhaps of all European authorities, did not know the variety. Most of the so called Snow apples of Europe, in fact, are white skinned and totally different from the Snow, or Fameuse, of America.

It is agreed that, whether the Fameuse came from Europe or not, it was distributed by the earliest of the French missionaries and planted by the first settlers. Quebec was founded shortly before 1600 and Montreal in 1641. The *seigniory du Cote de Beaupre,* said to be the oldest seignory in Quebec, was granted in 1636 and promptly colonized. Thus we have almost a hundred years of French settlement and missionary activity prior to 1700, the approximate date at which, according to Mr. Goodrich, the Fameuse was brought to Vermont. This seems to allow ample time for a Canadian origin for the variety and for its wide distribution in Quebec, Ontario and the northern states.

The early distribution of apples, either from Europe to Canada, or from place to place on this continent, was accomplished chiefly, almost exclusively, by seeds. Some of the missionaries knew the art of grafting, but there was small encouragement to practice it. From these considerations, and others which cannot be fully argued here, the writer is firmly convinced that the Fameuse originated in Canada from seed brought from France.

Variation.—Whether the first Fameuse was born in Europe or in America, it is perfectly certain that there have been many rebirths of the variety. One of the striking things about this type is its strong tendency to reproduce itself from seed. This has been taken advantage of, even within the last fifty years, and "Fameuse" apples have been grown from seed by the hundred and planted into orchards. This practice prevailed largely in Quebec, in neighborhoods where nurseries were scarce and grafted nursery trees expensive or unknown.

We may conclude therefore, that the modern Fameuse apples are most certainly not all from the same original stock. The conspicuous variations among them are thus to be accounted for, at least in part. It is a common saying that there are "two kinds of Fameuse." It would probably be more nearly the strict truth to say that there are two hundred kinds of Fameuse.

Aside from the variations which have come about through seed propagation, there are others doubtless due to bud variation. On the same tree one may often find a branch bearing dark red apples and another bearing light striped fruit. It is a question just how closely the fruit grower can reproduce these various colors by grafting; but the probability of their practical duplication is so great that the best propagators habitually select Fameuse cions from trees which bear abundantly and regularly and which give the desirable large dark red fruit.

The most conspicuous differences between Fameuse apples are in the coloring of the fruit; and the commonest distinction is that between "the red variety" and "the striped variety." In Quebec, where Fameuse is best known, these are commonly known as *Fameuse noire,* (sometimes as *Fameuse rouge*) and *Fameuse barre.* One particular stock of *Fameuse noire* is propagated at Abbotsford, Que., and in other neighboring townships.

Other varieties of the same type.—Seedlings of Fameuse, however, often show so much departure from the characters of the common Fameuse as to be readily recognized as something different. Such seedlings are generally accepted as new varieties, and, in cases where they show conspicuous merit, they are separately propagated by grafting, and eventually receive special names of their own. In this way originated McIntosh, Shiawassee, and the other varieties named and described below.

Besides the varieties of the Fameuse group named and described herewith, there have been many other seedlings which have had more or less of local reputation, and which are mentioned from time to time in pomological literature. St. Hilaire, or *Cabane du Chien,* originated at St. Hilaire, Que., and is figured and described by Downing. So far as I can learn from careful inquiry in the neighborhood of its nativity, it is not now propagated. *Gueule noire* was another Fameuse seedling originating at St. Hilaire about fifty years ago, but which appears now to have been lost. It is described as "larger than Fameuse, and very deeply colored."* "Sweet Fameuse No. 1, of St. Hilaire" is mentioned in the same reports. Elzear is another of the unpropagated Fameuse seedlings.† In 1883 a committee of the Montreal horticultural society made a search through the province for seedling apples of merit. A considerable number were collected, exhibited before the society, and described.‡ None was named at the time, however.

Other varieties which may belong with this type, but which I have not had the opportunity to examine, are as follows: Brilliant, of Mr. C. G. Patten, Charles City, Iowa; and Bloom, of Mr. E. W. Merritt, Houlton, Me. Certain other varieties, said to be seedlings of Fameuse, have been examined and discarded from the group.

Finally it should be said that a somewhat liberal policy has been followed in admitting varieties to this group, particularly in the case of Canada Baldwin. This apple differs considerably from the ideal type in points which may easily be considered generically essential, yet it seems to me to be nearly enough like Fameuse to have been sprung from it, and to have enough of the Fameuse characters to make them classifiable with this type. Scott, or Scott's Winter, is doubtfully excluded. The fruit from different sources, recently examined, indicates its close affinity with Fameuse; but there is some doubt about the authenticity of these specimens.

The St. Lawrence type.—St. Lawrence is thought to be a seedling of Fameuse. One may easily believe that it is. It is enough like Fameuse to be of that parentage, but its characters are sufficiently different so that one would hardly think of associating the two for purposes of classification. St. Lawrence, therefore, presents a type separate from Fameuse (in the natural history sense), but closely related thereto. Winter St. Law-

* Montreal Hort. Soc. Rpt. 12, p. 90 (1886).
† See Mont. Hort. Soc. Rpt. 13, p. 66 (1887).
‡ See Mont. Hort. Soc. Rpt. 9, p. 121-123 (1883).

rence is plainly of the St. Lawrence type. Burlington, or Burlington Pippin, thought to have originated at Burlington, Vt., seems to me to belong to the St. Lawrence type. Mr. W. A. Taylor suggests that perhaps the variety Mook, propagated by Mr. A. B. Greenlee, New Lebanon, Pa., is of this type.

The Jonathan type seems also to be somewhat closely related to the Fameuse.

Pomological status.—The Fameuse presents an important commercial type. Geographically it is central at the island of Montreal, where, it is often said—by Montreal people—that the best Fameuse in the world are grown. In Vermont we think that Isle LaMotte can raise the best Fameuse ever seen. Throughout the valley of the St. Lawrence, from Valleyfield almost to the city of Quebec, this is unquestionably the predominating market apple. In the neighboring regions of Ontario, Northern New York and New England, it is one of the first market apples, and second only to such sorts as Northern Spy, Rhode Island Greening and Baldwin where these latter can be successfully grown. Moreover, such varieties as McIntosh, Shiawassee and Scarlet Pippin promise to extend the geographical and commercial range of the Fameuse type into many sections where Fameuse itself has not take conspicuous lead.

The pomological characteristics of the type in general are finely colored fruit, with rather tender skin and flesh, the latter extremely white and usually strongly marked with red, very much subject to scab, ripening in late fall and early winter. The trees are usually fine, clean, rather spreading growers, come into fruitage early, and bear heavily and regularly. Crops are secured usually in alternate years, but this is simply because the trees are allowed to overbear in years of plenty. Proper thinning of the fruit, combined with proper feeding, will make an annual bearer of almost any tree of Fameuse or other varieties of this group.

III. DESCRIPTIONS AND NOTES OF VARIETIES.

The following varieties have been critically examined and are thought to conform closely enough to the Fameuse type to be properly admitted to this bulletin. The descriptions are all original, and are made from the specimens. These descriptions have been collecting in the station files for several years, and we have numerous descriptions of most varieties, taken from specimens from various sources, but mostly from Vermont, Quebec and Ontario.

Bissing

This variety I know only from specimens from Mr. Wm. Stammer, South Osborne, Wis., and from notes from the Division of pomology, U. S. Department of agriculture, the latter notes being made from specimens from the same source. The variety does not seem to be in propagation, and the description is therefore omitted. The color and aroma seem to place it with the Fameuse type, though the color and firmness of flesh are not characteristic of this group.

Canada Baldwin

Fruit oblate, size medium, cavity deep, flaring, stem long slender, basin medium deep, smooth, calyx medium, closed, color dull, dark red, striped and washed over light greenish yellow ground, dots several, white, bloom moderately heavy, skin tough, flesh white with much red, tender, core medium, flavor subacid with Fameuse aroma, juicy, quality good, season December-January, tree thrifty and hardy, bearing in alternate years under ordinary treatment. Described from specimens grown by Mr. Wm. Craig, Jr., Abbotsford, Que.

Originated in the orchard of Mr. Alexis Dery, St. Hilaire, Que., and thought to have come from seed of the New England *Pomme de fer.* This theory of its parentage may be regarded as extremely doubtful.

Fameuse (Synonyms *Snow, Pomme de Neige, Sanguineus, Chimney, Snow Chimney)*

Fruit round, slightly oblate, sometimes very slightly conic, size small to medium, cavity medium deep, rounded, stem medium long, slender, basin shallow, rather abrupt, even, calyx medium, closed, color a peculiar red, bright, sometimes nearly covering, sometimes only striped over a greenish yellow ground, dots minute, bloom thin, skin thin and tender, flesh very white, often marked with red, soft, juicy, core small, closed, flavor sprightly subacid, quality good to very good, season November 1st to December 1st, but will keep later under favorable circumstances, tree a thrifty, spreading, round-topped grower, coming early into bearing and yielding heavy crops in alternate years.

6

Requires high culture, manuring, thinning and spraying to make the best fruit.

Fameuse, Green

Fruit irregular round oblate, size medium, cavity rather deep, flaring, stem long slender, basin medium deep, abrupt, calyx medium large, color green with a pinkish crimson blush, much like Louise, dots several, inconspicuous, bloom moderate, skin tender, flesh white, tender, crisp, core medium size, flavor subacid, quality same as Fameuse, season October-November, tree much like Fameuse, of which it is evidently a seedling. Came up in the grounds of Mr. R. W. Shepherd, Como, Que. It does not seem to have any advantage over Fameuse, and as its color is much less attractive, it will hardly become popular. Mr. Shepherd has ceased to propagate it.

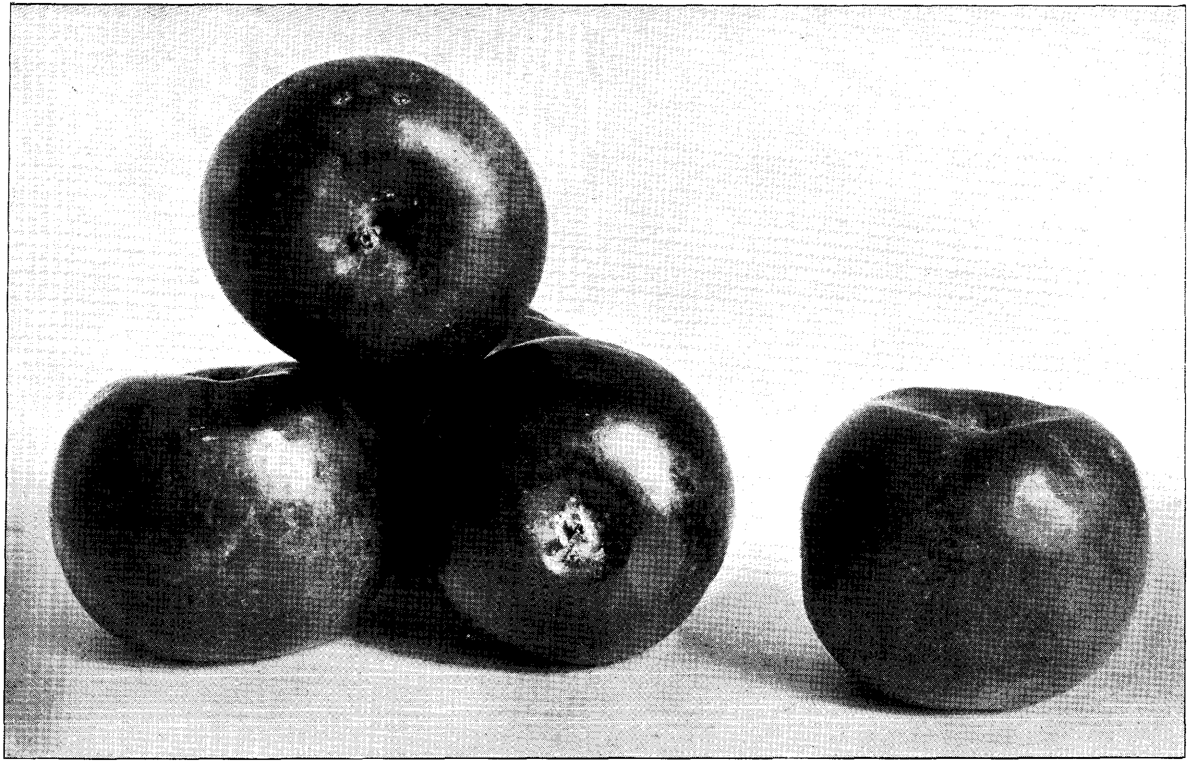
Fameuse Noire

Fruit very regular, nearly spherical, slightly oblate, size medium, cavity medium, even, stem medium short, basin medium deep, regular, calyx small, half-open, color dark, almost dull red, washed and splashed over a dull yellow, almost completely covering it, dots several, irregularly scattered, not conspicuous, bloom medium, skin rather tender, flesh white, crisp, juicy, red markings very faint, core medium, closed, flavor mild, sweetish subacid, quality good to my taste, better than Fameuse, season, same as Fameuse or later. Described from specimens grown by N. C. Fisk, Abbotsford, Que.

Fameuse Sucre

Fruit strongly oblate, size small to medium, cavity broad and flaring, stem comparatively long and slender, basin medium, rounded, a trifle corrugated, calyx large, open, color solid dark rather dull red, dots several, small, inconspicuous, bloom moderate, skin thin and tender, flesh white, always very much marked with red, core medium closed, flavor mild, sweetish, quality fair to good, season October-November, tree not so spreading as Fameuse, more willowy and upright. Hardy as Fameuse. Described from specimens grown by J. M. Fisk, Abbotsford, Que.

As explained elsewhere, there are several varieties of sweet Fameuse known, especially in the Province of Quebec. The one here described, however, is known as *"la vraie Fameuse sucre,"* the true sweet Fameuse.



McINTOSH. Grown in Isle LaMotte, Vt.

La Victoire

Fruit strongly oblate, slightly conic, smooth and regular, size large, cavity medium deep broad, stem short and stout, basin deep, abrupt, regular, calyx small, closed, color light crimson red, washed and striped, nearly covering a greenish ground, dots many, conspicuous, white, bloom considerable, skin tough, flesh white with red streaks, aromatic, core rather large, closed, flavor slightly subacid, quality good, much like McIntosh, season December or later. Described from specimens from W. T. Macoun, Ottawa, Ont.

The fruit has distinctly the peculiar aroma and flavor of McIntosh, with the same markings in the flesh. The flesh is firm and seems to be of better keeping quality than Fameuse. Form, size and color do not conform to the Fameuse type.

Louise (Synonym *Princess Louise)*

Fruit round, oblate, irregular, size medium, about like Fameuse, cavity rather shallow, broad, sloping, stem medium long, slender, basin regular medium deep, calyx half-open, color greenish yellow, with a conspicuous pinkish crimson blush, dots several, crimson, bloom thin, skin tender, flesh white, crisp, juicy, aromatic, core medium large, open, flavor sprightly subacid, quality good to very good, season November-December. Flesh resembles Fameuse in color, without the red streaks; it is aromatic, but with a slightly different aroma, and the flavor is easily distinguishable from that of Fameuse. The color is distinctly inferior to Fameuse. Described from specimens from Central experimental farm, Ottawa, Ont.

Originated near Grimsby, Ont., on the farm of Mr. L. Woolverton, probably from seed of Fameuse. It was first exhibited at the winter meeting of the Ontario Fruit Growers' Association in 1879. The first trees distributed through the nurseries were badly mixed with McIntosh, so that an impression has been given in some quarters that the two varieties are the same. They are very distinct, however.

McIntosh (Synonym *McIntosh Red)*

Fruit round oblate, slightly irregular, size medium large, cavity variable, sloping, nearly regular, stem usually short, basin medium deep, rather abrupt, calyx small, tightly closed, color nearly even dark rich wine red, shading to light pinkish crimson in the shade, dots many, bloom heavy and conspicuous, skin tough, flesh snow-white with crimson shadings, core medium, flavor subacid, aromatic, quality good, about like Fameuse, season December-January. A fine thrifty spreading grower. Comes into bearing early, but not so early as Fameuse. Not quite so prolific as Fameuse, but fruitful enough. Said to be less susceptible to the attacks of the scab fungus, but requires careful spraying, nevertheless, to get good fruit. This is really one of the best apples, either for market or home use, for planting in Vermont, especially in the northern counties.

This variety originated on the McIntosh homestead in Matilda township, Ontario. It was first propagated and distributed about thirty years ago by Mr. Allan McIntosh, whose father discovered the original tree when clearing away some second growth timber on the farm, then new.*

Scarlet Pippin (Synonym *Leed's Beauty*)

Fruit oblate, regular, size medium, cavity medium, spreading, stem medium short, basin shallow, nearly regular, calyx medium, closed, color light yellow, heavily washed and striped with bright crimson, beautiful, dots small, inconspicuous, bloom thin, waxy, skin thin, flesh white, slightly marked with pink, tender, juicy, core small, flavor mild subacid, rather flat, quality fair, season November-December, tree a strong upright grower, thrifty and hardy. Originated as a chance seedling with Mr. Harold Jones, Maitland, Ont.

This is an attractive fruit and seems to be worthy of propagation.

Shiawassee (Synonym *Shiawassee Beauty*)

Fruit strongly oblate, nearly regular, large, cavity deep, broad, flaring, slightly green-russet, stem medium long, slender, basin deep, abrupt, broad, slightly leather cracked, calyx medium, closed, color pinkish red, indistinctly striped and heavily overwashed with dark brilliant crimson, dots several, large, bloom thin, skin rather tender, about like Fameuse, flesh like Fameuse in all respects, core medium, half open, flavor sprightly sub-acid, quality good to very good, season December, tree a strong, thrifty, rather upright grower, coming into bearing early.

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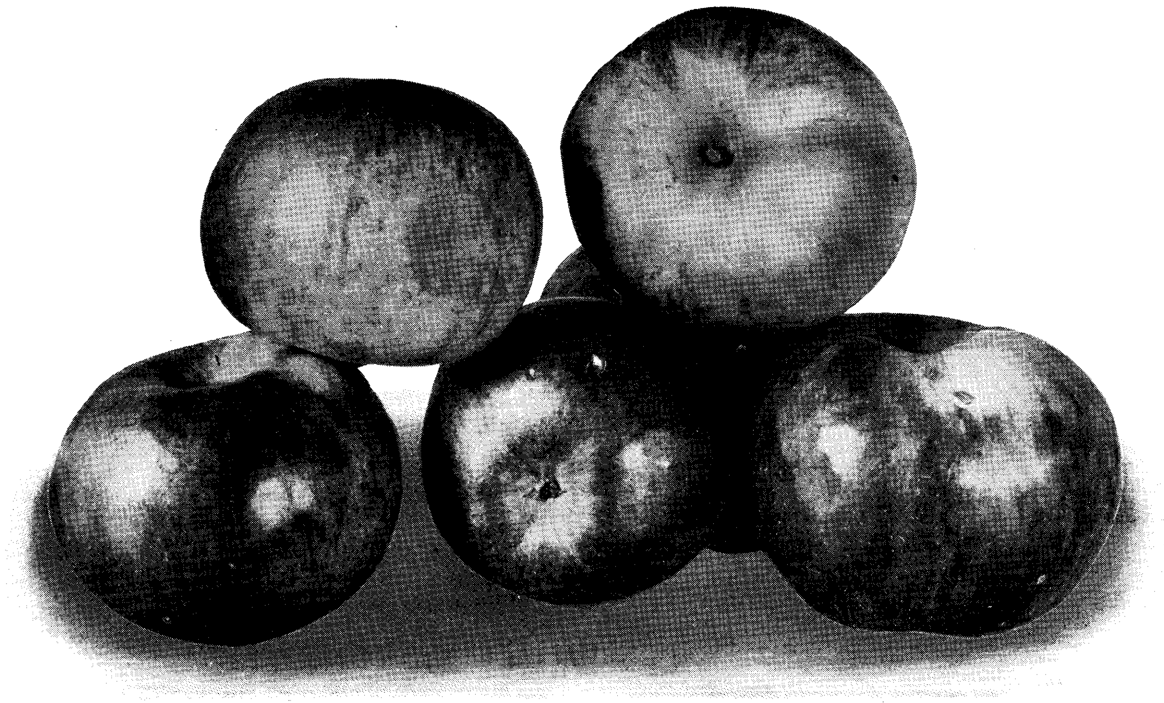
*See Can. Hort. 23, p. 24 (1900).



"SWEET FAMEUSE No. 2, OF ST. HILAIRE." Grown at Abbottsford, Que.

This is one of the best varieties of the Fameuse group, and deserves much more general planting. Mr. W. T. Macoun, horticulturist of the Central experimental farm, Ottawa, Ont., praises it as follows: "It is one of the most promising apples for family use. It is very much like the Fameuse, but larger, and the color is better with us at Ottawa, and the tree seems hardier, and altogether I think it one of the most promising apples we have. It is a heavy bearer, but bears every other year. We have them up to the middle of January."

Sweet Fameuse No. 2 of St. Hilaire

Fruit oblate, size medium to large, cavity rather broad, deep, stem usually short, stout, basin moderate, slightly ribbed, calyx variable, sometimes open, color rich bright red washed and striped over light yellow, dots few, inconspicuous, bloom moderate, skin thin, tough, flesh white with much red, rather soft, juicy, core medium, slightly open, flavor mild, sweet, rich, quality good to very good, season last of October to first of December, tree thrifty, upright, spreading, prolific, hardy. Described from specimens grown by Mr. Henry Marshall, Abbotsford, Que.

This is a beautiful apple, and the best in quality of the sweet Fameuse seedlings. It seems to be well worth propagation, though it has had only a local distribution thus far. It ought to be honored with a separate and distinctive name. The name here used is taken from Montreal Horticultural Society Report 12, p. 96. (1886).

ORCHARD CULTIVATION.

If cause of partial or entire fruit failure is sought, after the orchardist has fulfilled his part, it may confidently be expected to result from one of two interfering conditions. Either the fruit buds or growing fruit have been injured by untimely frost, or sufficient moisture has been lacking at some time during the growing season. Loss or damage from the latter cause is now quite as common here in the East as in the arid or semi-arid fruit-growing districts of the far West. There they have become fully convinced that no fruit need be expected without an adequate and continuous supply of moisture, either by conserving that falling during the wet season or artificially supplied, or by both methods combined. Here it will be presupposed that the orchardist has faithfully done his part in fertilizing, pruning, insect protection and, if need exist, in draining, and at June first has a fair setting of fruit. Up to that time, in the East and middle West, there is but little liability of drouth. It is the period from that date till harvest that is the most critical for the fruit-grower and which annually keeps the statisticians guessing as to the outcome.

Ripe fruit contains from 85 to 90 per cent of water. When we consider this fact in relation to another, that the leaves of a tree are constantly exhaling moisture into the air at the rate of hundreds of tons to each acre of large and thrifty fruit trees throughout the summer season, it becomes at once apparent how necessary it is that no moisture in orchard or vineyard should go to waste. It also becomes plain why fruit often drops in crop-ruining quantities even when a drouth is of but short duration when sufficient cultivation has not been given to conserve the moisture. The tree will obey the law of self-preservation by sacrificing its fruit rather than its life.

Where special attention has not been given to moisture-conservation by cultivation, it is not generally understood how absolute a protection against evaporation of soil moisture is afforded by a dust mulch. A convincing and practical illustration of its efficacy was witnessed last season in a garden potato patch, which, after deep plowing and thorough preparatory tillage, was given conscientious stirring and cultivation from once to three times weekly. The desideratum being to allow no crust to form favorable to moisture dispersion, this was continued throughout the growth of the crop. Although the season was unusually dry, and the soil such as to be easily affected by drouth, the potatoes yielded a magnificent crop, both in size and quality. At all times during the period named moist earth could be found within two or three inches of the surface, while a half dozen feet away, on either side, where no cultivation was practiced, the soil was destitute of moisture for at least eighteen inches below the surface.

Later in the season the same fact was emphasized when the writer had an opportunity to witness orchard cultivation in the far West, notably in California. There were observed tree-breaking crops of splendid fruit just adjoining others of the same age, variety, and otherwise equally as well cared for except in the cultivation given, the latter showing only partial crops of inferior, shriveled fruit, all the way down to absolute crop failures in all cases corresponding closely to the cultivation and artificial moisture supplied. The best results were evident in that climate of constant sunshine and moisture-less atmosphere, where a dust mulch of five or six inches was provided. It was there also made evident that those depending on irrigation, without much regard to cultivation, were often no better off than the orchards unirrigated. The uninterrupted supply of moisture is an absolute necessity for the best fruit results. Just as soon as the supply fails, the fruit begins a premature ripening which is fatal to its perfect future development, even should its stem remain unparted from the parent tree.

The point I would especially emphasize is that no one with an orchard of bearing age, which at its best is capable of realizing its owner, in East or West, from $50 to $100 per acre, net, when properly handled, can afford to convert the moisture rightly belonging to the fruit into grass or other crops, or what is equally bad for the fruit, allow the moisture to escape into the air through the medium of a hard, uncultivated soil crust.—*B. F. W. Thorpe, in Country Gentleman.*

SPRAYING IN BLOSSOM.

Mr. Beach made an interesting report to the Western New York Horticultural Society on the value or damage of spraying trees in bloom.

The New York experiments agree with all careful observations everywhere in the conclusion that it is worse than useless to spray trees when in blossom. There are some circumstances which may partially excuse such a practice; but unless very extraordinary conditions prevail, such spraying does no particular good, and it usually does a great deal of harm. It is a direct damage to the fruit-grower, without any reference to its effect on the bees, and it is apt to be disastrous to the bees. Some fruit-growers are still in doubt about the value of bees in their business; but in our estimation they are indispensable.

ORCHARD CROPS.

"Crops in the Orchard" was the title of a paper read by W. R. Wilkinson who pronounced apples the first and best orchard crop, then hogs. As he had made a success of both, and is now more enthusiastic than ever, despite the loss of nearly his whole crop of apples by bitter rot, all were anxious to learn his methods. He grows and markets his hogs without the use of any corn whatever, growing such crops as supply an all-the-year-round ration to hogs, while they assist materially in the growth of the orchard. He keeps his orchard in plats of twenty to thirty acres in a plat, sows some of these with red clover for hogs, but would not grow clover more than two years in succession on the same ground. He sows Dwarf Essex rape early in spring, either in drills or broadcast, and finds hogs do better on it than on clover. This grows well in fall also, and stands the cold about like turnips. It does not add any fertility to the soil, but this is balanced by the hogs, which harvest their own feed. He sows winter barley, and finds it a good crop to turn hogs in and to harvest for themselves. Of course, grow crops to suit the condition of growth of trees Young trees should be cultivated from April till September. Too much cultivation of bearing trees causes too much wood growth. He has now nearly 27,000 trees, and does not fear that we will ever produce too many good apples.—*Report of meeting of Missouri Horticultural Society.*

RENOVATE THE OLD ORCHARD.

There are many old and some middle-aged orchards, once profitable, but now sources of loss. At the same time, there are men in this state who are investing labor and capital in renovating such orchards, and find it a paying business. Will it not pay some of us who have land occupied by neglected and unproductive apple trees to give them another and a fair chance? Let me outline a course of treatment for such trees for this season.

1. *The trees need pruning.* This should be done at once. First take out all the dead, diseased and interfering branches; remove all suckers and sprouts from the bases and trunks of the trees. Second, scrape off the roughest of the old bark with an old hoe or other suitable tool, being careful not to injure or expose the live parts beneath.

2. *The trees need spraying.* The first spray should be given before the buds burst. Use Bordeaux mixture. Consult spray calendar. Continue the spraying as directed.

3. *The trees need tillage.* The sod should be thoroughly pulverized. This may be accomplished, if the sod is not tough, by using a springtooth harrow or disc harrow. If sod is tough and dense, turn it over with a plow and work down fine with a harrow. Plow away from trees and as shallow as possible near them. Till at least once in ten days up to the middle of July.

4. *The trees need fertilizing.* Fertilizers may be furnished through green manures. During the last half of July, harrow and drill cow peas (Whippoorwill or Blackeye) at the rate of one and a half bushels per acre. If drilling is impracticable, broadcast, rolling the ground afterwards. The interest in the experiment may be increased by using different cover-crops; for instance, cow peas on one part, Canada peas on another, and crimson clover on a third.

5. *Record your observations.* In order to obtain an accurate idea of the value of the experiment, a profit-and-loss account should be kept. Charge the field with cost of labor and materials used, and credit it with the returns. An immediate response in the way of a crop of fruit should not be expected—this should come the second year—but the trees will, in the meantime, take on renewed vigor and appearance of health.—*John Craig, Cornell University.*

FRUIT SPECIALISTS.

Prof. Green of Minnesota is quoted as saying that the time is coming when fruit will be grown only by specialists. He says—or it is said that he says—that the ordinary man is too careless and shiftless and ineffectual in his treatment of fruit trees. He cannot compete with the man who makes a specialty of fruit-growing, and who cares for his orchards in the best ways known. Prof. Green is perfectly safe in such a prediction. In fact he might pass it for a statement of present fact and not be so very far wrong. There are still a good many farmers who grow fruit as a "side line" without any particular care for the best methods; but any one may observe that they cut a wonderfully small figure in the markets. A good illustration of the situation came to notice last fall. In one neighborhood the apple buyers were thick and prices were good—$1.50 to $3 a barrel. In another neighborhood in the same state, apples were rotting on the ground by the hundreds of bushels, and prices ranged from 75 cents a barrel down to nothing at all, with the barrel thrown in. The difference was merely that the former neighborhood had a reputation for apples based on the careful work of many professional apple growers; while the other neighborhood had grown its apples "on the side."—*Country Gentleman.*

HORTICULTURAL MEETINGS.

The various state horticultural meetings are just beginning to come off, and it is very easy to see who are the leading horticulturists in each state. They are the men who go to the meetings and take part. Is there a man anywhere who does not want to be a leading horticulturist in his state? Let him stay away from the meetings of his state society. It is odd though, when it is so apparent that the societies are composed almost exclusively of leading men, that more men do not aspire to join the ranks of the successful and influential ones. The fact is, it just about amounts to this, that a man who has not the ambition and the enterprise to attend the meetings of his state horticultural society, hasn't the qualities to make him a success in the practice of horticulture.

POLLINATION IN ORCHARDS.

VARIOUS REASONS WHY FLOWERS DO NOT SET.

All observing fruit-growers have seen trees which blossom full but do not set a fair amount of fruit; many have found their orchards unprofitable for this reason. It is a practical point to know the causes of this loss and the best way to prevent it.

In the first place, but a small percentage of the blossoms set fruit anyway, even in the most favorable seasons and with the most productive varieties. In blossoming time a Japanese plum tree is a mass of white, carrying scores of flowers on a single branch; yet scarcely a dozen fruits may set on that twig, and some of those must be removed or the tree will overbear.

This normal failure in the setting of fruit blossoms may be due to a number of causes; as poorly nourished fruit-buds, lack of pollination, or winter injury to the pistils which cannot be seen with the eye alone. It is usually a distinct advantage to the fruit-grower, as it saves thinning. If all plum blossoms set fruit, the expense of thinning would be multiplied many times. Only when the failure of fruit blossoms to set becomes general, does the fruit-grower feel the loss and call for an explanation.

Young trees generally set little or no fruit the first few years, when they are growing fast, although they may blossom full. With most varieties this early dropping of the blossoms occurs only two or three seasons, but Northern Spy and a few other varieties of apples are often unfruitful ten to thirteen years from this cause. Older trees may show the same results if stimulated too highly with nitrogenous fertilizers. The logical remedy is to check this excessive growth of wood by withholding nitrogen or by putting the orchard into sod for a few years.

If the weather is warm and wet in early spring, conditions are favorable for the growth of fungi and it sometimes happens that fruit blossoms are "blasted" by the early growth of these parasites. Apple and pear scab may kill the blossoms, but more often it kills the young fruits soon after they are set. Wherever spraying is practiced faithfully, the killing of fruit blossoms by fungi need not occur, especially if one thorough application is made to the trees before the buds open.

The unfruitfulness which often follows a rain during the blooming season is sometimes confused with self-sterility. A careful fruit-grower watches the weather anxiously when his trees are in blossom, for he knows this is the most critical period in the growth of the crop. Like winter injury to fruit buds, there is no way of preventing this loss except to secure a more favorable location, since it is not in man's power to prevent rain, however much he may be able to induce it by bombarding the sky. Nevertheless, it is interesting to know in what way rain decreases the setting of fruit.

Drying winds during the blossoming season are not common in the East but are often serious in some parts of the West. Luther Burbank, one of our best observers and experimenters in orchard pollination, says a dry wind sometimes causes a short fruit crop in some parts of California by drying up the juices of the stigma so that the pollen cannot germinate.

SUMMARY.

Scarcely one fruit blossom in ten sets fruit, even in the most favorable seasons and with the most productive varieties.

Trees making a very vigorous growth may drop their blossoms.

A PROFITABLE FAMEUSE ORCHARD. Owned by Athur H. Hill, Isle LaMotte, Vt.

Brown rot, apple or pear scab, and pear blight may kill the blossoms.

Frost injury to blossoms is of all degrees. Even flowers which appear to be uninjured may be so weakened that they cannot set fruit.

Rain during the blooming season prevents the setting of fruit chiefly by destroying the vitality of the pollen, injuring the stigma, or by preventing fertilization because of the low temperature. The washing of pollen from the anthers seldom causes serious loss.

Insects are probably more important than wind for carrying pollen from tree to tree.—*Extracts from bulletin of Cornell University Experiment Station.*

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